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A CITY OF SKYSCRAPER DEVELOPMENTS—MID-TOWN NEW YORK
Public Library in the Foreground, the Chrysler Building in the Center, and the Lights of Queens Boulevard in the Distance

Volume 4 ~ AMERICAN SOCIETY OF CIVIL ENGINEERS FOUNDED 1852 ~ *Number 12*

DECEMBER 1934

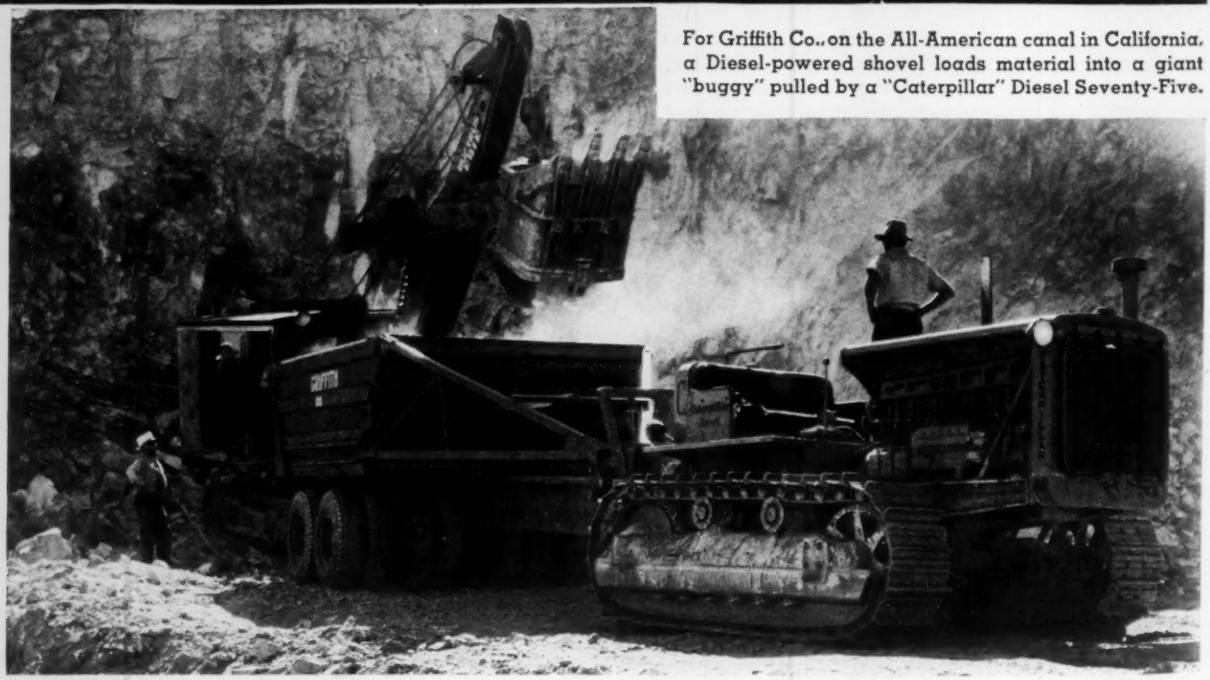
"THE 'CATERPILLAR' DIESEL HAS CUT OUR FUEL BILL MORE THAN 80%"

—SAY LUEBKEMAN BROTHERS, OF BUENA PARK, CALIFORNIA, WHOSE FUEL COST FOR THE DIESEL IS LESS THAN ONE-FIFTH THAT OF AN EQUAL-POWERED GASOLINE TRACTOR.

OWNERS are enthusiastic over their Diesel economies in power costs—enthusiastic, too, about other "Caterpillar" features. Luebkeman Brothers write: "The 'Caterpillar' Diesel burns all the fuel, runs evenly when it idles, accelerates fast, lugs better than anything we have ever seen." Ask for the full story of "Caterpillar" Diesel Tractors and Power Units. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

A. J. Schrader, of Scranton, Pa., uses "Caterpillar" Diesel power to remove the overburden for coal stripping operations.

AMERICA GOES DIESEL · AMERICA GOES DIESEL



For Griffith Co., on the All-American canal in California, a Diesel-powered shovel loads material into a giant "buggy" pulled by a "Caterpillar" Diesel Seventy-Five.

Among Our Writers

CARLTON S. PROCTOR has specialized in the design of foundations for heavy and difficult buildings, bridges and dams. For 15 years he has been associated with Daniel Moran, M. Am. Soc. C.E., with offices in New York. Mr. Proctor, a graduate of Princeton, has been active in Society work, more recently as Chairman of the Code Committee. Among the larger structures on which his firm has been consulted are the Golden Gate Bridge, the George Washington Bridge, and the Conowingo Dam.

M. A. DRUCKER for the past 22 years has been engaged on New York City subway and elevated rapid transit work, including the investigation of special problems involving active pressures of earth and its passive resistance. For about 6 years of this period he was assistant designing engineer, designing and preparing the plans for a number of subway sections and the one elevated section of the City's Independent Rapid Transit System, including several bridges.

HARRY J. ENGEL was graduated from the Johns Hopkins University in 1926. From that time until 1929 he was employed by Modjeska, Masters and Chase at office work and shop inspection on the building of the Tacony-Palmyra Bridge at Philadelphia. There followed four years of varied experience, including airplane stress analysis and research work with the Electric Railway Presidents Conference Committee. Since early in 1933 he has been again in the employ of Modjeski, Masters and (now) Case, Inc., engaged in field work and design.

GAVIN HADDEN has been engaged in private engineering practice since 1919, specializing in the design and supervision of construction of facilities for recreation and athletics and of airports; and in consultation on problems connected with them. Examples of work on which he has served are: the athletic plants (both indoor and outdoor) at Brown University and at the University of Rochester; the Dyche Stadium, Northwestern University; the Indoor Athletic Building, Harvard University; and the New York University Gymnasium.

ROBINS FLEMING, in the 51 years of his active engineering career, most of which was spent with the American Bridge Company, had a wide range of experience in the design of buildings. Of the hundred or so articles that he has written, many relate to wind action on buildings. His volume on *Wind Stresses in Buildings* was published in 1930.

J. C. MEEM has engaged in heavy subway and underpinning work in New York for the past thirty years. During this time he has developed improved methods of tunneling in soft ground, and of building cofferdams and caissons. He has contributed liberally to technical literature with articles concerning his specialty. Mr. Meem graduated from Virginia Military Institute in 1885.

JAMES M. MACMARTIN received his technical training at Rensselaer Polytechnic Institute and entered the service of the Delaware and Hudson Company at Albany as a draftsman in 1890. Advancing step by step through the engineering department he became chief engineer in 1901, a position he has held to date, with the exception of two years in which he was engaged in general contracting. Mr. MacMartin is also chairman of the valuation committee of the railroad corporation.

JACOB FELD graduated from the College of the City of New York and has done graduate work at the University of Cincinnati. After several years work for consulting engineers and contractors on bridges and buildings, he opened a consulting engineering office in New York in 1925. His recent work has been almost exclusively in the field of expert testimony and as a consultant to engineering contractors on "heavy" work, preparing and checking estimates, construction procedure, plant layout, caisson and cofferdam design, foundation problems, soil studies, and control of soils for foundations, walls, and abutments.

VOLUME 4 NUMBER 12

December 1934

Entered as second class matter September 23, 1930, at the Post Office at Easton, Pa., under the Act of August 24, 1912, and accepted for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized on July 5, 1918.

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CIVIL ENGINEERING

Published Monthly by the

AMERICAN SOCIETY OF CIVIL ENGINEERS

(Founded November 5, 1852)

PUBLICATION OFFICE: 20TH AND NORTHAMPTON STREETS, EASTON, PA.

EDITORIAL AND ADVERTISING DEPARTMENTS:

33 WEST 39TH STREET, NEW YORK

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SUBSCRIPTION RATES

Price, 50 cents a Copy; $5.00 a year in advance; $4.00 a year to Members and to Libraries; and $2.50 a year to Members of Student Chapters. Canadian postage 75 cents and foreign postage $1.50 additional.

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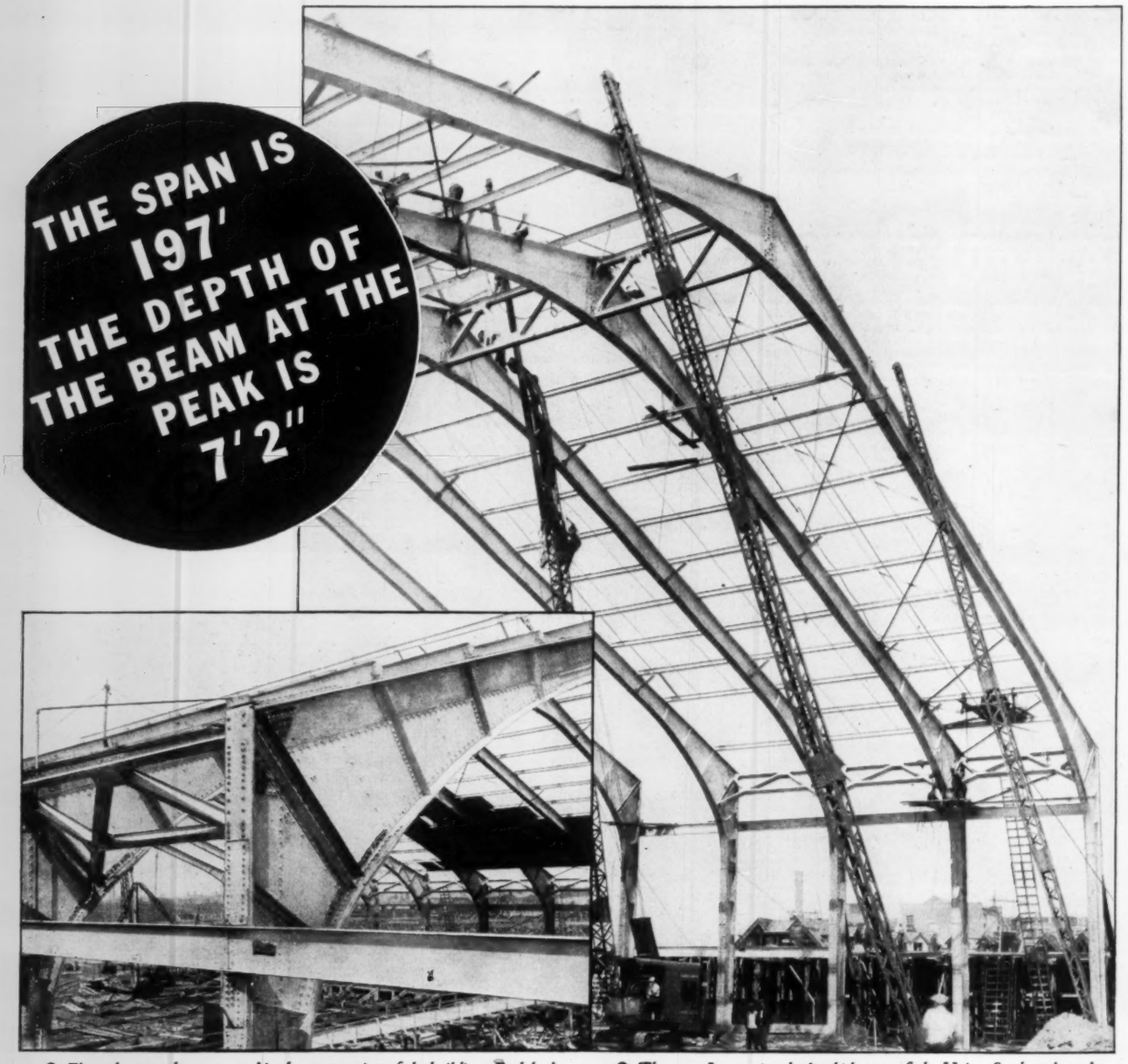

● *Eleven beam arches were used in the construction of the building. Each had a span of 197 feet, with a center height of 80 feet and a column height of 45 feet.*

● *The new International Amphitheatre of the Union Stockyards and Transit Company, Chicago. A. Epstein was the structural engineer in charge, V. McClurg co-operating. The steel was erected by Calumet Construction Company. Fabricators were Hansell-Elcock Co., Chicago.*

NEW BEAM ARCHES *Fabricated from—*

C B SECTIONS

● Here is striking evidence of the advantages of beam-arch construction for roofs with wide unsupported spans. A remarkable saving in clear headroom is possible. For a required height, walls can be lower and costs are reduced accordingly.

Speed of construction was another notable factor in this building. Arches were erected at an average rate of two per day—another factor in reducing costs. Additional information on the use of C B SECTIONS for beam arches may be had upon request.

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CIVIL ENGINEERING

DECEMBER 1934

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VOLUME 4

NUMBER 12

Foundation Design for Trans-Bay Bridge

Domed Cofferdams Prove Successful in Constructing Piers in San Francisco Bay on Rock at Unprecedented Depth

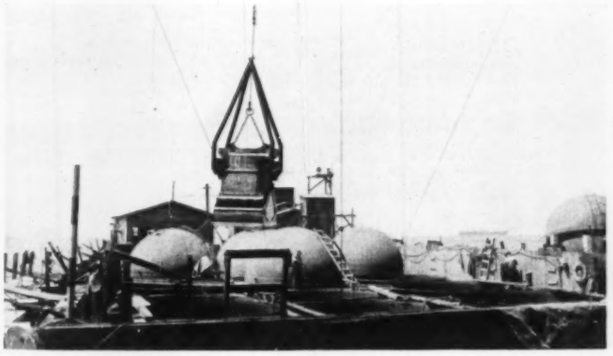
By CARLTON S. PROCTOR
MEMBER AMERICAN SOCIETY OF CIVIL ENGINEERS
MORAN AND PROCTOR, CONSULTING ENGINEERS, NEW YORK, N.Y.

A NOVEL cofferdam was developed for the piers of the San Francisco–Oakland Bay Bridge. This type of design was necessitated by the unprecedented conditions of a depth of 120 ft to the bay bottom and an additional 130 ft of soil over the bedrock. The conventional open cofferdam was discarded because the hydraulic pressures would have required too much internal bracing to be practical. Likewise, the false-bottom type was abandoned because it would have been very difficult to remove the exceedingly heavy bottom construction. Engineers decided that both of these types would require too much handling. In the type adopted a "false bottom" was provided pneumatically by controlling the air pressure in each cylindrical dredging well by capping the cylinder with a dome. As sinking to position progressed, the domes were burned off the cylinders, a few at a time, and sections were added to the length of the cylinders. Then, after the domes were rewelded in place, the cylinders were placed under air. That the domed cofferdam has proved its worth is attested by the safe landing and sealing of five of them on bedrock under San Francisco Bay. In this article, prepared from an address given before the Metropolitan Section of the Society on October 17, 1934, Mr. Proctor explains the considerations that led to the design and construction of this new method of handling caissons in deep water.

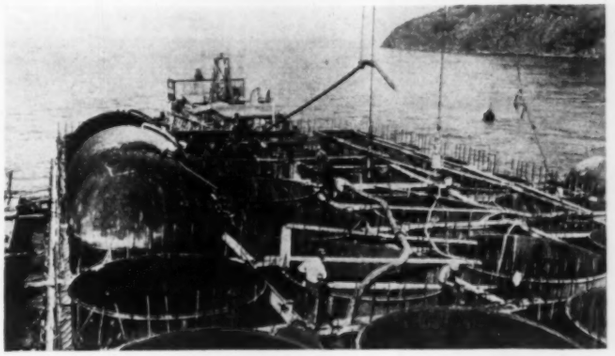
THE San Francisco–Oakland Bay Bridge probably presents more fascinating problems to the foundation engineer than does any other modern structure. The earliest studies of plans indicated that it would be necessary to develop pioneer designs in order to meet the unprecedented conditions.

Spanning San Francisco Bay from Rincon Hill in San Francisco across Yerba Buena Island to the Oakland Mole in Oakland, the bridge fills an economic demand that has been steadily increasing for the past 20 years. It will largely replace a present ferry traffic of 500 boats a day between the thickly populated East Bay area and San Francisco's business section. This structure, which is $8\frac{1}{4}$ miles long, compares in size with the world's largest bridges, as shown in Fig. 1.

The West Bay crossing between San Francisco and Yerba Buena Island includes two 2,210-ft suspension spans with side spans of 1,160 ft, supported by cables 29 in. in diameter. The common central anchorage, which is 97 by 192 ft in plan and extends from rock at 220 ft below water to a height of 295 ft above the harbor level, will support the unbalanced live load on the two suspended spans. The crossing is carried through Yerba Buena Island in the largest bore rock tunnel ever attempted, the finished inside clear diameter of the tunnel being 65 ft 6 in. The East Bay crossing includes a



PLACING CONCRETE SEAL IN BOTTOM OF CAISSON NO. 5
Air Pressure Carried on Part of Cylinders



SINKING CAISSON NO. 6 IN WEST BAY CROSSING
Air Pressure Maintained in Certain Cylinders to Control Sinking

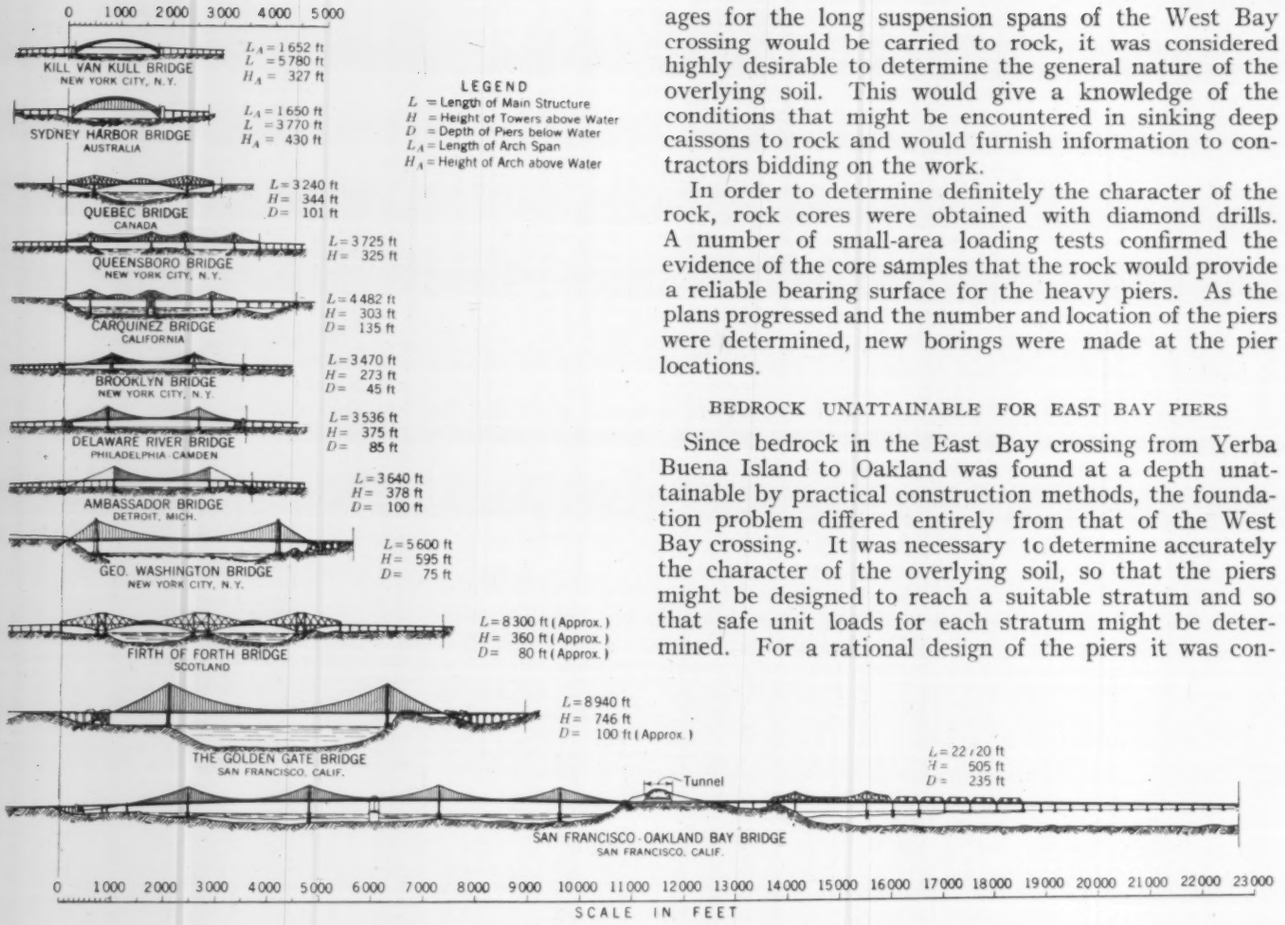

0 1000 2000 3000 4000 5000
KILL VAN KULL BRIDGE
NEW YORK CITY, N.Y.
L_A = 1652 ft
L = 5780 ft
H_A = 327 ft
SYDNEY HARBOR BRIDGE
AUSTRALIA
L_A = 1650 ft
L = 3770 ft
H_A = 430 ft
LEGEND
L = Length of Main Structure
H = Height of Towers above Water
D = Depth of Piers below Water
L_A = Length of Arch Span
H_A = Height of Arch above Water
QUEBEC BRIDGE
CANADA
L = 3240 ft
H = 344 ft
D = 101 ft
QUEENSBORO BRIDGE
NEW YORK CITY, N.Y.
L = 3725 ft
H = 325 ft
CARQUINEZ BRIDGE
CALIFORNIA
L = 4482 ft
H = 303 ft
D = 135 ft
BROOKLYN BRIDGE
NEW YORK CITY, N.Y.
L = 3470 ft
H = 273 ft
D = 45 ft
DELAWARE RIVER BRIDGE
PHILADELPHIA-CAMDEN
L = 3536 ft
H = 375 ft
D = 85 ft
AMBASSADOR BRIDGE
DETROIT, MICH.
L = 3640 ft
H = 378 ft
D = 100 ft
GEO. WASHINGTON BRIDGE
NEW YORK CITY, N.Y.
L = 5600 ft
H = 595 ft
D = 75 ft
FIRTH OF FORTH BRIDGE
SCOTLAND
L = 8300 ft (Approx.)
H = 360 ft (Approx.)
D = 80 ft (Approx.)
THE GOLDEN GATE BRIDGE
SAN FRANCISCO, CALIF.
L = 8940 ft
H = 746 ft
D = 100 ft (Approx.)
Tunnel
SAN FRANCISCO-OAKLAND BAY BRIDGE
SAN FRANCISCO, CALIF.
L = 22,420 ft
H = 505 ft
D = 235 ft
0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 11000 12000 13000 14000 15000 16000 17000 18000 19000 20000 21000 22000 23000
SCALE IN FEET

FIG. 1. SAN FRANCISCO–OAKLAND BAY BRIDGE
Compared with Other Notable Bridge Spans

1,400-ft cantilever span immediately east of Yerba Buena Island, followed by five 509-ft spans and fourteen 291-ft truss spans.

WEST BAY PIERS FOUNDED ON BEDROCK

In Fig. 2 the geological formation of the crossing is shown. Bedrock for the West Bay crossing was found at a maximum depth of 250 ft below high tide, but east from Yerba Buena Island it slopes away so rapidly that it is inaccessible for the foundations of the East Bay crossing.

In the early stages of foundation study it was decided to obtain full information on subsoil conditions by making complete borings and soil tests. Never before have the principles of soil mechanics and the results of soil laboratory tests been so fully utilized in a foundation design. The object of such experiments and tests was as follows: (1) to ascertain the most desirable location for the center line of the bridge; (2) to determine the best location for individual piers; and (3) to form a logical basis for the design of the piers. The program adopted was intended to determine the depth to bedrock and the character of both the rock and the overlying soil.

Although it was anticipated that the piers and anchorages for the long suspension spans of the West Bay crossing would be carried to rock, it was considered highly desirable to determine the general nature of the overlying soil. This would give a knowledge of the conditions that might be encountered in sinking deep caissons to rock and would furnish information to contractors bidding on the work.

In order to determine definitely the character of the rock, rock cores were obtained with diamond drills. A number of small-area loading tests confirmed the evidence of the core samples that the rock would provide a reliable bearing surface for the heavy piers. As the plans progressed and the number and location of the piers were determined, new borings were made at the pier locations.

BEDROCK UNATTAINABLE FOR EAST BAY PIERS

Since bedrock in the East Bay crossing from Yerba Buena Island to Oakland was found at a depth unattainable by practical construction methods, the foundation problem differed entirely from that of the West Bay crossing. It was necessary to determine accurately the character of the overlying soil, so that the piers might be designed to reach a suitable stratum and so that safe unit loads for each stratum might be determined. For a rational design of the piers it was considered necessary to determine the structural characteristics and the behavior of the supporting soil under load. It was also important to determine the character of the strata above the foundation level as affecting problems of excavation and construction.

Routine laboratory tests included determinations of specific weight, moisture content, specific gravity of constituent grains, sizes of constituent grains, and Atterberg limits. Compression tests were made on 2 by 2-in. cubes and cylinders without lateral restraint and on $4\frac{3}{4}$ by 9-in. cylinders with and without lateral restraint. In Fig. 3 there is shown a sketch of the consolidation test apparatus used.

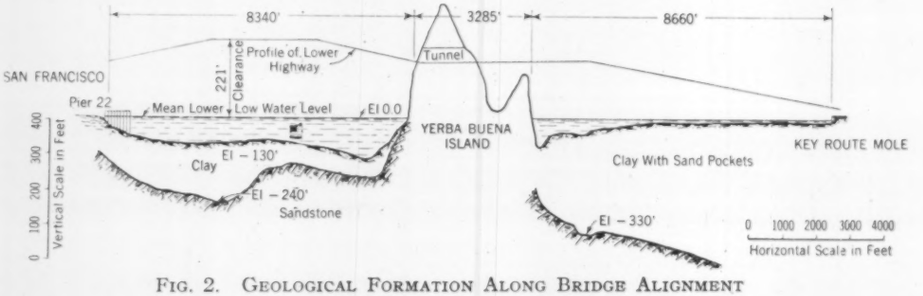


FIG. 2. GEOLOGICAL FORMATION ALONG BRIDGE ALIGNMENT

DEPTH OF PIERS BREAKS WORLD RECORD

The principal foundation problem lay in the design of the piers for the West Channel crossing, where they

went to a maximum depth of 250 ft below high water, and where the open water reaches a depth of 115 ft.

The Hawkesbury Bridge at New South Wales, Australia, long held the world's record for pier depth—that of 162 ft. Then came the Huey Long Bridge in New Orleans, with its piers reaching to a depth of 180 ft. But the piers of the San Francisco–Oakland Bay Bridge, extending to a maximum depth of 240.7 ft below mean low tide in the West Bay Channel and 242 ft in the East Bay Channel, exceed the maximum depth of the piers for the Hawkesbury Bridge by 50 per cent. Such a depth is far beyond the limit of possible pneumatic construction, and the only practicable type of installation that can be employed is the open dredging method. Also, because of the very heavy lateral forces caused by winds, currents, and possible earthquake impulses, the piers must have large horizontal dimensions.

It is obvious then that the principal problem of design lay in the matter of controlled flotation. Precedent indicated the use of one of two methods of foundation flotation: either the braced cofferdam system, or the false-bottom method. The depth of open cofferdam for caisson flotation varies from one-half to three-fifths of the depth of water, and there were many objections to the use of a cofferdam to resist hydrostatic pressures

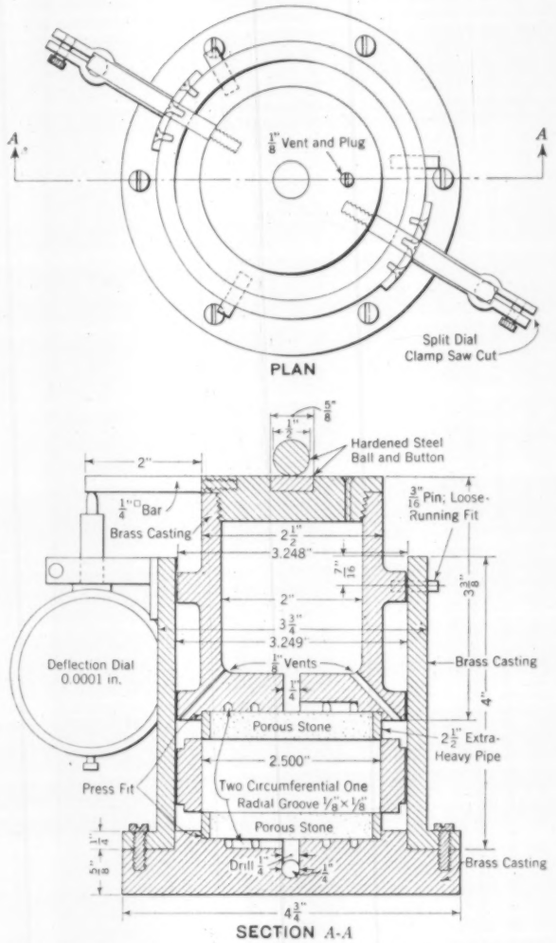


FIG. 3. APPARATUS FOR MAKING CONSOLIDATION TEST ON SOIL SAMPLES
Foundations for East Bay Crossing

in this type of design. Some of the principal objections were lack of safety, high cost, and questionable feasibility, and the weakening effect on the permanent pier that would have resulted from the veritable forest of cofferdam bracing required. A false bottom to resist 120 ft of hydrostatic uplift must of necessity be extremely heavy and difficult of removal. Furthermore, the risks and hazards to the stability of the pier are tremendous in the operation of removing such false bottoms.

NOVEL DOMED COFFERDAM PROVIDES AN EFFECTIVE PNEUMATIC FALSE BOTTOM

The idea of developing pneumatic "false bottoms," was conceived by Daniel E. Moran, M. Am. Soc. C.E. The caisson that he developed provided flotation and

CAISSON NO. 4 UNDER CONSTRUCTION IN SHIPWAYS
World's Largest Caisson. It Measures 92 by 197 Ft. Caisson No. 6 in the Foreground

complete control at all stages of sinking until adequate support had been obtained, and complete flexibility and control in the removal of the false bottoms. In Fig. 4 is shown the perspective developed in the office of Moran and Proctor, consulting engineers of New York, N.Y., during the period of making design studies. From this came the caisson design later patented and used for the West Bay crossing. By capping the cylinders and applying air pressure in the cylindrical dredging wells, the water is depressed to any desired level, and perfect stability and flotation control are assured during both the period of flotation and the sinking stages.

In Fig. 5 is shown the process of landing a caisson and beginning excavation in it. The Moran caisson method has the additional valuable safety factor that, by using a low-head cofferdam in conjunction with the cylinders, the center of gravity of the caisson is kept well below the metacenter, thus providing a strong righting moment to prevent the caisson's getting out of plumb or tipping. When the caisson reaches the bottom of the bay, the air pressure is reduced in the cylinders and the caisson is landed gradually. It is under perfect control as to position.

This method provides the further novel advantages that at any time, while the cutting edge is within allowable working depths, airlocks may be placed on the domes and workmen may enter the cylinders to remove obstructions at the cutting-edge level. Whenever the domes are in use they serve to keep the caisson from listing, as the effective center of gravity is lowered and the load on the cutting edge is reduced. During the operation of sealing the caisson on sloping rock, air pressure may be used to reduce the effective weight on the cutting edge. Also, air pressure may be reduced at any time during the process of sinking, in any cylinder or group of cylinders, when added weight is required.

CAISSON NO. 4, ON RIGHT, READY TO BE FLOATED TO POSITION
On Left, Caisson No. 6 Showing Transition from Square, Cutting-Edge Section to Cylindrical, Dredging-Well Section

The advantages of this method are well illustrated by experience on Caissons Nos. 4, 5, and 6 for the West Channel piers. At the time of landing, the weight of Caisson No. 4 was partially carried by the underlying soil and partially by air pressure; then water was gradually introduced into the cylinders as the air pressure was released. By means of this operation, as shown in Fig. 6, the enormous weight of the caisson was transferred slowly to the underlying soil, and after the load had been wholly transferred it was found that the caisson was settling. No material entered the dredging wells, but the soil under the entire area was gradually being squeezed out due to the enormous weight that was being supported. To overcome this, domes were replaced on part of the cylinders, and the water in these cylinders was extracted as air pressure was introduced. This reduced the load on the underlying soil, and the settlement ceased. If this had been a false-bottom caisson of the usual type, upon removal of the false bottoms the entire structure would have settled to a considerable distance before coming to rest, and in so doing would no doubt have developed a serious list.

Caisson No 5, which had to pass through the mud only a short distance before landing on an inclined rock surface, could develop only a small amount of skin friction. In this instance, it proved advantageous to carry air pressure on part of the cylinders during excavation and also during the preparation and concreting of the bottom. This operation is shown in one of the illustrations. Under such circumstances, it is obvious that either a false-bottom caisson or a floating caisson would have given considerable difficulty in handling.

Caisson No. 6 landed upon a stiff stratum of mud overlying a softer one. This upper stratum was capable of carrying the entire caisson load, and dredging was necessary to cause settlement. When the upper layer was finally dredged through at the thinnest point, the caisson listed. In this instance, it was advantageous to use air pressure to reduce the weight and also to have certain of the cylinders capped with domes so that low air pressure could serve as a brake against any tendency toward a reverse listing as the caisson broke through the heavy upper stratum on the opposite side.

CERTAIN DESIGN ASSUMPTIONS MADE

Because of such factors as the swift flowing tide, the physical characteristics of the site, the tremendous amount of ferry traffic and large number of ocean-going ships traversing the line of the bridge, and the very heavy fogs on the bay, it was considered essential to plan both the design of the foundations and the construction procedure to be used by the contractor so as to minimize risks. The steel wales and struts were designed on the following assumptions: (1) that the water would be expelled from the cylinders only to a depth of 10 ft above the cutting edge; (2) that not more than 10 per cent of the domes would be removed at one time for extending the tops of the cylinders; and (3) that the cutting edge would penetrate the mud 15 ft.

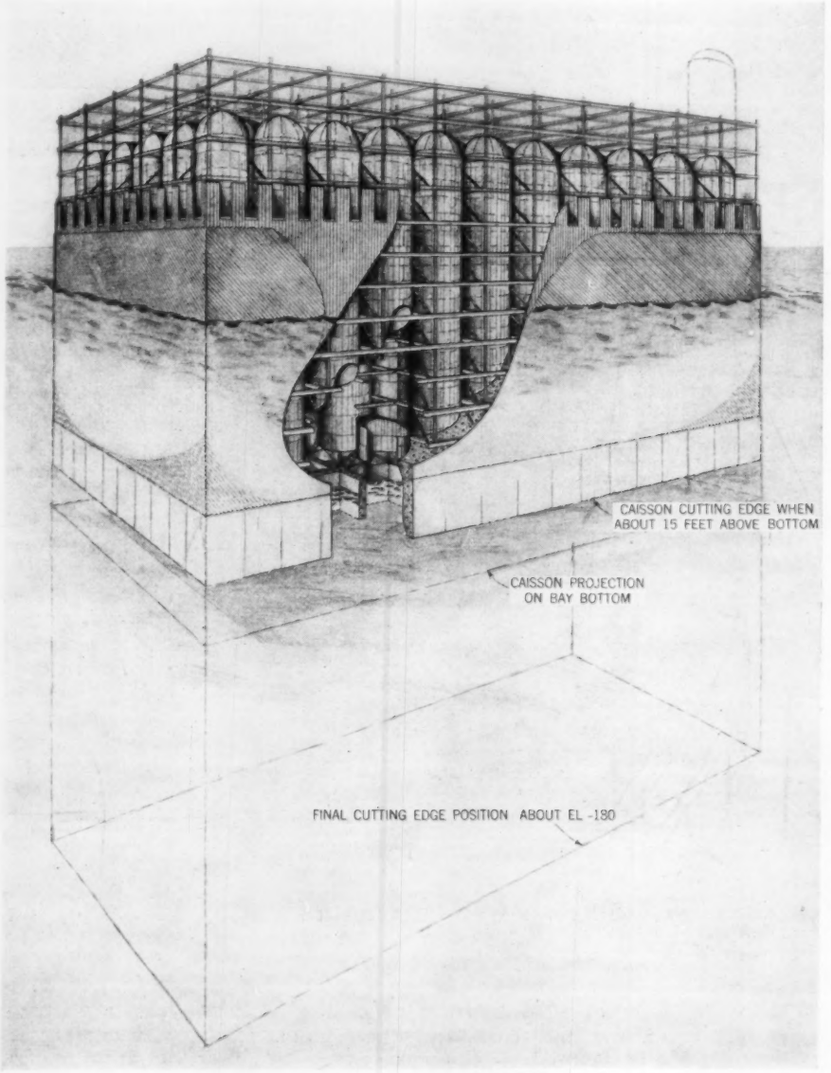
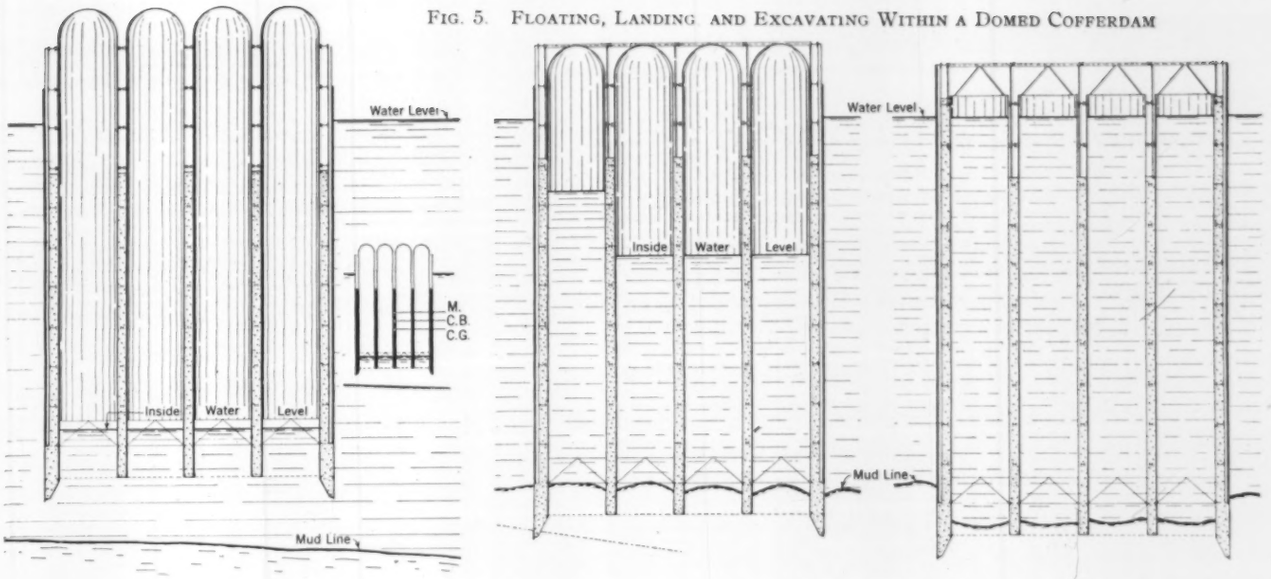
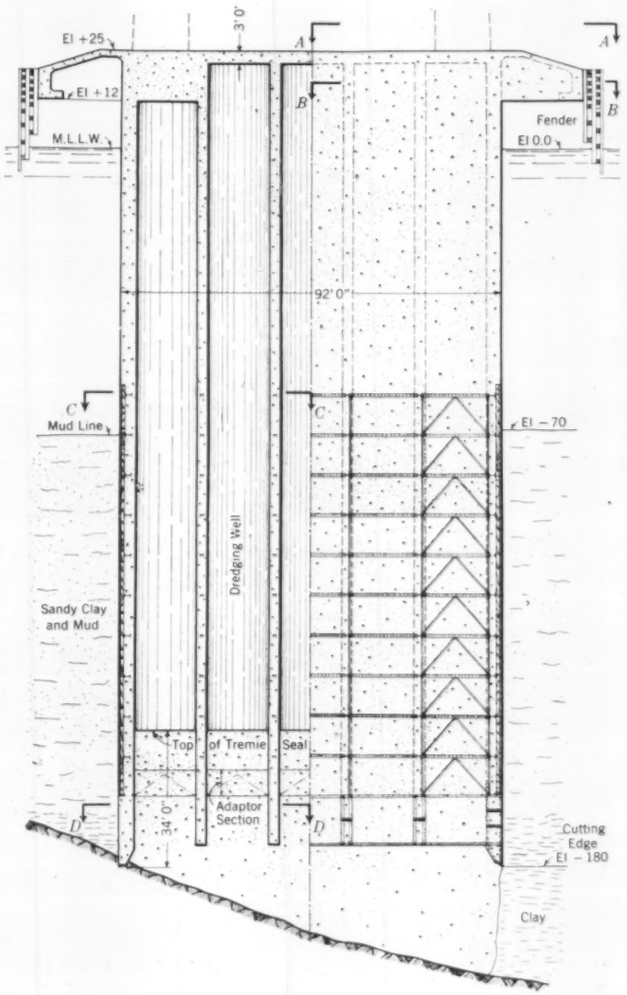

CAISSON CUTTING EDGE WHEN ABOUT 15 FEET ABOVE BOTTOM
CAISSON PROJECTION ON BAY BOTTOM
FINAL CUTTING EDGE POSITION ABOUT EL -180

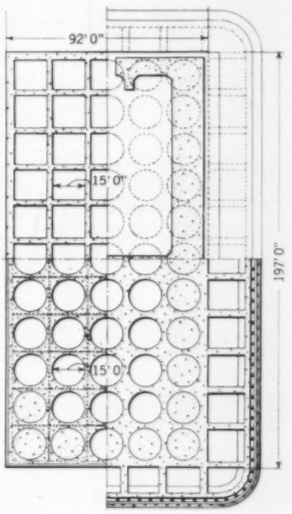
FIG. 4. PERSPECTIVE OF THE DOMED COFFERDAM

FIG. 5. FLOATING, LANDING AND EXCAVATING WITHIN A DOMED COFFERDAM



With these basic assumptions established, it was then possible to make comparative studies involving different cylinder sizes and wall thicknesses. Each study required a thorough investigation of flotation and stability, bracing and cylinder design, stress determination for the final pier, and estimates of cost. It was from these studies that the final design was evolved, which has proved to be economical, thoroughly practicable in each stage of installation, and the fulfillment of every hope as far as reduction of the usual hazards and contingencies is concerned.





Section *D-D* Section *A-A*
Section *C-C* Section *B-B*

FIG. 6. LANDING CAISSON NO. 4 AND PLACING SEAL

An illustration shows Caissons Nos. 4 and 6 just prior to the time of their launching from their shipways at the Moore Shipyards. This photograph shows the hollow, watertight, cutting-edge girders, which provide flotation for the launched caisson and which are later filled with concrete. After caisson flotation is accomplished by the air pressure in the cylinders capped by their domes, the walls above the cutting-edge girders are also filled with concrete. The cutting-edge girders form a pattern of squares 15 ft on a side, each square being centered under its superimposed cylinder. The transition from the 15-ft square, cutting-edge section to the cylinder with a 15-ft diameter is made in an adapter section, as shown in the illustration of Caisson No. 6. There the adapter sections are in place, and the steel wales and struts are in the process of installation. In the same photograph, alongside Caisson No. 6, is Caisson No. 4, which is the largest structure of its kind ever sunk. At the stage illustrated, Caisson No. 4 had been built to the point where it was nearly ready for towing.

Work on the foundations of the West Bay crossing has progressed to the point where the piers and anchorages are completed and the steel towers are being erected. It is expected that the operation of stringing the cable wires will begin in February 1935.

Embedment of Poles, Sheeting, and Anchor Piles

A Mathematical Treatment of the Acting Forces and the Resistance of the Soil to Movement

By M. A. Drucker

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Engineers whose work involves the erection of poles for supporting electrical conductors or the design of sheet-pile retaining walls, with their anchor piles, will find in this article a new approach to an old design problem. Little has appeared concerning stability problems of this kind in American engineering literature. In this article, Mr. Drucker presents diagrams for the quick determination of the safe depth a pole should be embedded in the ground to sustain a given horizontal load and derives the formulas on which the curves are based. Briefly, he treats of the theory involved in increasing the resistance of a pole to pull-over or breaking by adding concrete collars and special anchorages to that part of the pole in the ground. Also he considers the depth to which sheeting should be driven, and the safe load for an anchor pile behind a sheet-pile retaining wall.

Scant attention has been given in the past to the anchorages of structures subject to overturning moments, and depending for their stability solely on the resistance of the soil to the pressures exerted by their embedded part. What little discussion has appeared is inadequate for calculating the depths of embedment necessary to resist the tendency to overturn. Therefore such depths have generally been determined by empirical rules. This is as true of the embedment of trolley, telegraph, and telephone poles as of cantilever sheeting and unbraced anchorage piles. In the case of poles, the longer the pole, the greater the depth of embedment, although not in direct proportion. In the case of cantilever sheeting, it is sometimes recommended that the ratio of the depth of embedment to the total length of sheeting be constant. Such rules may provide a greater factor of safety than necessary in some cases and be unsafe in others, depending on the acting forces and the nature of the soil. The formulas and diagrams that follow should make it possible to place the design of such structures on a more rational basis.

This analysis will be made on the fundamental basis that all horizontal forces must balance and that moments about the bottom of sheeting or poles, due to these forces, must be equal to zero. To simplify the analysis, it will be assumed that: (1) the pole or sheeting has no flexibility; (2) there is no friction at the faces and bottom of the pole or sheeting; (3) the induced resisting pressure at any point cannot exceed the maximum passive resistance of the soil at that point; and (4) the variation in pressure is linear.

Consider the case of a pole rotated by the application of a force H_1. This action would tend to induce pressures in the soil as represented by GTE and GAB in Fig. 1. The total pressure represented by the area GTE would equal that represented by the area GAB plus the value of H_1. Since both the active pressure and passive resistance of the soil at the ground surface are equal to zero, the triangle of passive resistance in front of the pole would have to be such that the intensity at the ground surface would be zero. If TQB represents the maximum possible passive soil resistance in front of the pole for the total depth of embedment, OTN would represent that part of the passive resistance brought into action in front of the pole, and OJB would represent the total back-kick. The pressure represented by OTN would be equal to that represented by OJB plus the value of H_1. Also, the difference in the moments of these pressures around point B must equal the moment of H_1 around the same point. The effect of OTN and OJB are the same as the effect of BTQ minus that of NJQ, because BTQ is the total maximum passive resistance at the front of the pole and NJQ the total back-kick plus that part of BTQ not brought into action.

Let H_2 represent the pressure BTQ acting at a distance $\frac{D}{3}$ above B, and let H_3 represent the pressure NJQ acting in the opposite direction at a distance $\frac{D_2}{3}$ above B. Also, let K represent the known or assumed maximum passive resistance of the soil, in pounds, per foot of pole, of a given diameter, at a depth of 1 ft; and let JQ equal Y. Then,

for lateral stability, $H_1 = H_2 - H_3 = \frac{KD^2}{2} - \frac{D_2 Y}{2}$. [1]

To resist rotation, $H_1 D_1 = \frac{KD^2}{2} \times \frac{D}{3} - \frac{D_2 Y}{2} \times \frac{D_2}{3}$. [2]

From Equation 1,

$$D_2 = \frac{KD^2 - 2H_1}{Y} \text{ and, } D_2^2 = \frac{(KD^2 - 2H_1)^2}{Y^2} \quad . \quad [3]$$

From Equation 2, $6H_1D_1 = KD^3 - D_2^2 Y$,

$$\text{or, } D_2^2 = \frac{KD^3 - 6H_1D_1}{Y} \quad . \quad . \quad . \quad . \quad [4]$$

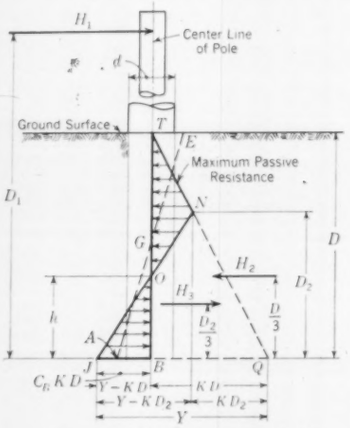

Fig. 1. Diagram of Forces Acting on a Pole

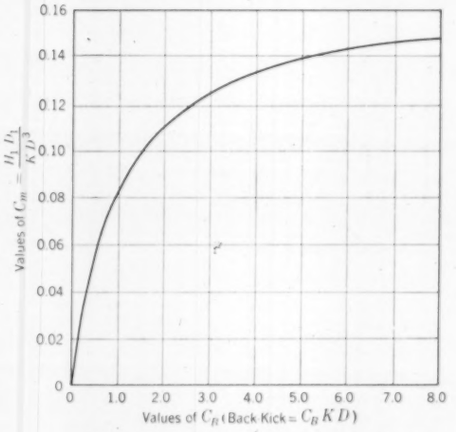

Fig. 2. Diagram of Coefficient of Resisting Moment

From Equations 3 and 4,

$$Y = \frac{(KD^2 - 2H_1)^2}{KD^3 - 6H_1D_1} = \frac{(KD^2 - 2H_1)^2}{KD^3 - 6M} \quad . \quad . \quad . \quad . \quad [5]$$

From Equation 5 the maximum intensity of the back-kick, JB, can be determined when K, D, H_1, and D_1 are known. But generally the depth of embedment, D, is the unknown factor, or if it is known, the necessary value of K may be desired. To solve for either D or K, the limiting value of Y must be assumed. Equation 5 may be considered as expressing the exact relationship between the active force and the passive resistances it calls forth. To facilitate computations, however, an approximation will be made.

The triangle TNO represents the passive soil resistance at the front of the pole, and the triangle JBO that at the back. Then, for lateral stability, TNO equals JBO plus H_1. As, for the case of poles, the value of H_1 will always be small in comparison with the passive resistance, JBO, it will be assumed that TNO equals JBO. This would make the area of the traingle JNQ equal to that of TBQ, as $BONQ$ is common to both triangles.

If now C_B denotes the coefficient of the back-kick, JB, in terms of KD, then

$$Y = KD + C_BKD = (1 + C_B)KD,$$

and the area of the triangle

$$JNQ = (1 + C_B)KD\left(\frac{D_2}{2}\right).$$

As this area is equal to that of TBQ, which equals $KD\frac{D}{2}$,

then $$(1 + C_B)KD\frac{D_2}{2} = \frac{KD^2}{2}$$

and $$D_2 = \frac{1}{1 + C_B}D \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad [6]$$

Also, from similar triangles, $$h = \frac{D_2(Y - KD)}{Y - KD_2} \quad . \quad . \quad [7]$$

Substituting $\frac{D}{1 + C_B}$ for D_2, and $(1 + C_B)KD$ for Y,

then, $$h = \frac{1}{2 + C_B}D \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad [8]$$

The resisting moment around the bottom of the pole equals

$$TBQ\left(\frac{D}{3}\right) - JNQ\left(\frac{D_2}{3}\right) = \frac{KD^2}{6}(D - D_2) =$$
$$\frac{KD^2}{6}\left(D - \frac{D}{1 + C_B}\right) =$$
$$KD^3\left[\frac{1}{6}\left(1 - \frac{1}{1 + C_B}\right)\right] = C_mKD^3 \quad . \quad . \quad [9]$$

where $$C_m = \frac{1}{6}\left(1 - \frac{1}{1 + C_B}\right). \quad . \quad . \quad . \quad . \quad . \quad [10]$$

The $C_m - C_B$ curve in Fig. 2 was plotted so that values of C_m could be readily obtained for various values of the coefficient C_B.

The overturning moment, M, equals H_1D_1. Since the resisting moment must balance it,

$$C_mKD^3 = H_1D_1. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad [11]$$

and $$K = \frac{H_1D_1}{C_mD^3}. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad [12]$$

Also, $$C_m = \frac{H_1D_1}{KD^3} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad [13]$$

from which $$H_1 = \frac{C_mKD^3}{D_1} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad [14]$$

and $$D = \sqrt[3]{\frac{H_1D_1}{C_mK}} = \sqrt[3]{\frac{M}{C_mK}} \quad . \quad . \quad [15]$$

For the purpose of obtaining a value for the constant K, from experiments, the data contained in Bulletin

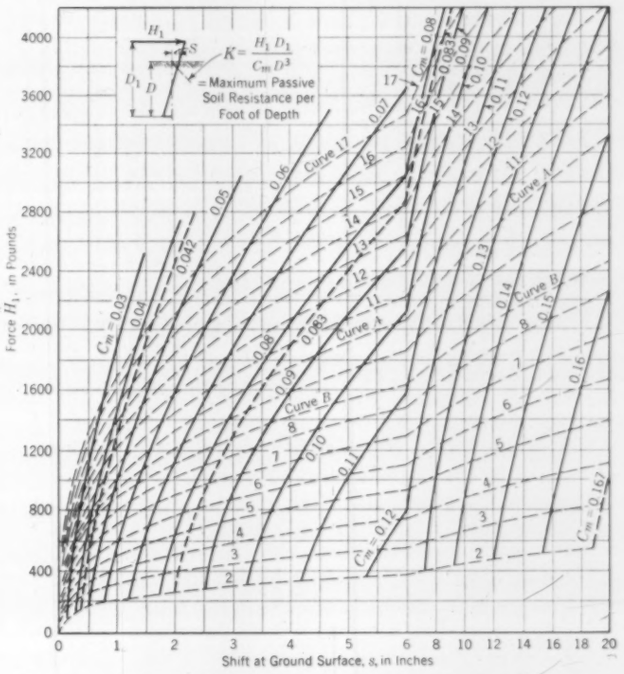

FIG. 3. FORCES, POLE MOVEMENTS, AND C_m COEFFICIENTS
Depth of Embedment, D, Equals Approximately 5 Ft

No. 3 of the Engineering Experiment Station of the North Carolina State College of Agriculture and Engineering were used. The soil in which the poles were set was a hard clay except for 8 or 10 in. of sandy clay at the ground surface. The depth of embedment varied between 3.5 and 5.5 ft. These depths were sufficient to resist the forces that broke the poles, which varied between 850 and 3,300 lb. In only two cases were the poles pulled over. The first step was to plot points representing the shift (s) of the pole at the ground surface for each pole tested, and the horizontal pull, H_1, which caused the shift. The pull was the breaking force and the shift the displacement of the pole at the ground line at the time of breaking. The shifts were plotted because it was considered that no matter what elements make up the anchoring power of the soil, the extent of the pole movement should be a measure of the total passive resistance. It was noted that several fairly smooth curves could be passed through a number of points representing the H_1 and s coordinates for poles having nearly the same diameter and embedded about 5 ft. Points of equal C_m value were then obtained on these curves. These points were joined together, giving the C_m curves shown in Fig. 3.

By the use of the curves in this figure, the value of K for each pole tested, whose depth of embedment was between 4.5 and 5.5 ft, was determined by obtaining the value of C_m for the H_1 and s coordinates, and substituting it in Equation 12.

Values of K obtained from the equation,

$$K = 1{,}500 + 150\,d. \quad . \quad . \quad . \quad . \quad . \quad [16]$$

were slightly less than the lowest obtained from the individual experiments for the corresponding pole diameter, d. This equation may therefore be considered to give safe values of K for the soil in which the poles were tested. However, Fig. 3 may be used to determine the value of K for any pole embedded in any soil, provided that the depth of embedment is about 5 ft and that the shift, s, and the force H_1 causing it are known. Of course the value of K thus obtained could then be used for other depths of embedment.

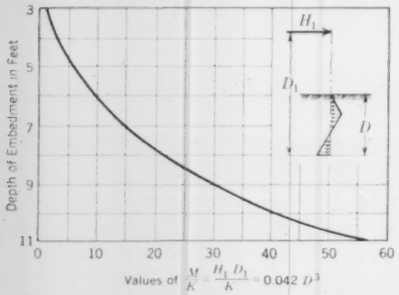

FIG. 4. SAFE EMBEDMENT FOR GIVEN OVERTURNING MOMENT AND SOIL RESISTANCE

For experiments on poles embedded at depths other than 5 ft, approximate values for K may also be obtained by gradually increasing the force H_1 until the pole is pulled over and then assuming that for this limiting condition the resisting moment coefficient, C_m, is equal to 0.15. By substituting this value for C_m in Equation 12, the value of K may be obtained. The value of 0.15 is suggested as a limit for C_m since the total passive resistance, BTQ, for which C_m would be 0.167, could not be brought into action. Values somewhat over 0.14 were obtained for several of the tests made at the North Carolina State College in which the poles were broken and not pulled over. Furthermore, from data on pole tests which were continued until the poles were pulled over, values of K obtained by using a constant value for C_m of 0.15 varied approximately the same as those derived from the curves in Fig. 3. These tests are not recorded in the previously mentioned Bulletin No. 3 of the North Carolina State College of Agriculture and Engineering. Both sets of tests were conducted with the cooperation of the North Carolina Light and Power Company.

For poles, the value of K may be expressed in a more general form, as follows:

$$K = A + K_1 d \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad [17]$$

in which A is a constant, in pounds, depending on the nature of the soil, and K_1 is the passive resistance in pounds per inch of width and foot of pole for that soil.

FACTOR OF SAFETY AGAINST OVERTURNING

In Fig. 3 the H_1-s curves resemble the stress-strain curves of more elastic materials, since at some point on each of them the shift s begins to increase at a much faster rate than the applied force H_1. Such points may be said to exist where the line for a C_m value of 0.042 intersects the H_1-s curves. As the suggested maximum value for C_m is given as 0.15, the factor of safety would be about 3.5 for a value of 0.042 for C_m. It is to be understood that a safe allowable force is one that will not cause the pole to rotate to such an extent that it will be unable to regain its original position.

Using a value of 0.042 for the C_m coefficient, for reasons previously given, and utilizing Equation 11,

$$\frac{H_1 D_1}{K} = \frac{M}{K} = C_m D^3 = 0.042\, D^3 . \quad . \quad . \quad [18]$$

On this basis the diagram in Fig. 4 was prepared. From this the necessary depth of embedment may be readily obtained if H_1 and D_1 are given, and K is either known from experiment or is assumed. The overturning moment M may include moments caused by horizontal forces other than wind, and also moments due to vertical loads on the deflected pole or to loads carried on brackets cantilevered from the pole.

For standard conditions and an average soil, the following equation may be used to determine the necessary depths of embedment for poles:

$$D = 3.75 + \frac{L}{16} \quad . \quad . \quad . \quad . \quad . \quad . \quad [19]$$

in which D is the depth of embedment and L is the total length of the pole, both in feet. The values of D obtained from this equation will be such as to give a constant value of C_m for the various pole lengths if substitutions are made in Equation 13. Equation 19 was derived by starting with a standard depth of embedment of 6.5 ft for a 45-ft pole and then assuming the same force near the top of the pole due to wind on the wires, and the same unit wind force on the projected areas of other poles.

INCREASING THE RESISTANCE OF POLES TO OVERTURNING

It is sometimes considered advisable to increase the bearing area between pole and soil for some distance below the ground surface. This may be done by placing a concrete collar around the pole or by attaching short horizontal timbers to it. Concrete placed around poles just below the ground surface, or timbers attached to the two faces of a pole below the ground surface, may be used when it is desired to increase the resistance to overturning due to wind forces, which may act in either direction normal to the line. Where a pole is located at an angle in the line and cannot be braced or guyed, the problem of obtaining additional resistance to overturning is somewhat different. For such a case it is necessary to increase the passive resistance at the inner side of the pole near the ground surface, and that at the outer side at the bottom of the pole. This may be accomplished by attaching logs or planks to the pole at these points, or by placing concrete there. Formulas will be derived for the additional value of the anchorage of such poles.

If M_A represents that part of the overturning moment about the bottom of the pole to be taken care of by the special anchorage, then by reference to Fig. 5,

$$P_T = P_B = \frac{M_A}{D - (E + F)} \quad . \quad . \quad . \quad . \quad [20]$$

in which P_T and P_B represent, respectively, the resultant pressures on the parts of the top and bottom logs or blocks of concrete that extend beyond the pole. If K_1 represents the known or assumed maximum passive soil resistance per foot of depth per inch of width, then

$$P_T = 2\, L_T K_1 E d_T \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad [21]$$

Equating Formulas 20 and 21,

$$\frac{M_A}{D - (E + F)} = 2\, L_T K_1 E d_T$$

from which, $$L_T = \frac{M_A}{2\, K_1 E d_T\, [D - (E + F)]} \quad . \quad . \quad . \quad [22]$$

Also, $$P_B = 2\, L_B K_L d_B \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad [23]$$

in which K_L is the intensity of the passive resistance at

the midpoint of the lower log or concrete block. The value of K_L can be obtained by taking into account the fact that when the maximum intensity of the back-kick equals 0.33 K_1D, which corresponds to a value of 0.042 for C_m, the point of rotation, O, is 0.43 D above the bottom of the pole, so that

$$K_L = \frac{0.33K_1D(0.43D - F)}{0.43D} = K_1(0.33D - 0.77F) \quad [24]$$

Equating Formulas 20 and 23,

$$L_B = \frac{M_A}{2K_Ld_B[D - (E + F)]} \quad [25]$$

Substituting the value of K_L from Equation 24,

$$L_B = \frac{M_A}{K_1d_B(0.66D - 1.54F)[D - (E + F)]} \quad [26]$$

When timbers are used, the midpoint of the upper log is generally 1.5 ft below the ground surface and the midpoint of the lower one is 1.0 ft above the bottom of the pole. Substituting these values for E and F in Equations 22 and 23, for a special anchorage consisting of timbers,

$$L_T = \frac{M_A}{2K_1 \times 1.5 \times d_T(D - 2.5)} = \frac{M_A}{3K_1d_T(D - 2.5)} \quad [27]$$

and $$L_B = \frac{M_A}{K_1d_B(0.66D - 1.54)(D - 2.5)} \quad [28]$$

ANALYSIS OF CANTILEVER SHEETING

Analysis for the anchorage of cantilever sheeting is similar to that for poles. There are, however, some differences to be considered. Let EB, Fig. 6(a), represent the sheeting; EAB, the active pressure on the back of it due to the earth; $CGFA$, the active earth pressure due to concentrated loads at some distance away from the sheeting; and H_1, the resultant of these pressures acting at a distance D_1 above the bottom of the sheeting. The area BTQ represents the maximum possible passive resistance of the soil in front of the sheeting, and H_2 is its resultant acting at a distance of D_5 (equal to $D/3$) above the bottom. Where the sheeting is below water, the water pressure on both sides will balance, but in obtaining active pressure and passive resistance of soil, the buoyant effect of the water must be considered.

If D_1 were equal to D_5, the passive resistance would be triangular, as indicated by BTM, with a possible maximum allowable value represented by BTQ. If the position of H_1 were below H_2, the passive resistance would be as indicated by BLN, BL being equal to three times D_1. But generally D_1 would be greater than D_5, and the tendency would be for the passive resistance to vary as indicated by $BTRS$. As TR cannot be greater than zero, the passive resistance would have to be as indicated in Fig. 6(b), either as represented by $TN'J'B$ or by TNO and OJB, depending on the magnitude and point of application of H_1.

To determine the distribution and maximum intensity of the passive pressures necessary to resist the resultant force H_1, let H_2 represent the resultant of the known or assumed maximum passive soil resistance, as indicated by BTQ, acting at a distance, $D/3$, above the bottom of the sheeting; let H_3 represent the resultant of that part of the passive resistance not brought into action, as indicated by $J'N'Q$ acting at a distance D_6 above the bottom of the sheeting; and let H_3 also represent the resultant of JNQ. Also, let K equal maximum passive resistance of the soil, in pounds per square feet of sheeting at a depth of 1 ft; then JQ or $J'Q$ equals Y.

The simplified formulas and diagrams obtained to determine the anchorage of poles cannot be applied to sheeting, as H_1 is not a constant but varies with D. Also, as the ratio of D_1/D is small in this case, the approximations made in deriving the formulas for poles make them unreliable for sheeting. However, by assuming a value for Y in Equation 5, a diagram can be made that is helpful in determining the necessary depth of embedment. This value of Y will be taken as equal to $2KD$, so that the maximum intensity of the back-kick will be limited to the theoretical maximum intensity of the passive resistance in front of the sheeting. This assumption corresponds to a value of 0.083 for the coefficient C_m instead of 0.042 as suggested for poles. The reasons for suggesting the higher value for sheeting are as follows: that experiments show the actual passive resistances of soils to be about twice the theoretical values; that the maximum intensity of the back-kick is limited to the maximum theoretical passive resistance for the depth of soil in front of the sheeting instead of that at the back, which is greater; and that sheeting may be allowed to tilt more than poles, since the active pressure is continuous, and the sheeting will not have to come back to its original position.

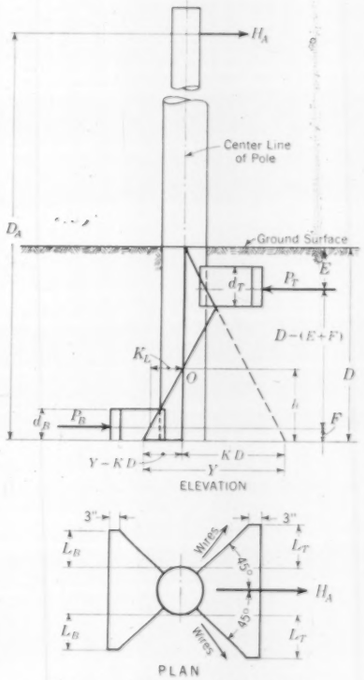

FIG. 5. CORNER POLE WITH SPECIAL CONCRETE ANCHORAGE

With these assumptions, Equation 5 becomes:

$$Y = 2KD = \frac{(KD^2 - 2H_1)^2}{KD^3 - 6H_1D_1}$$

For a homogeneous soil, on both sides of the sheeting, for its entire depth,

$H_1 = Cw\frac{D_4^2}{2}$, where w is the weight of the soil per cubic foot allowing for the buoyancy of the water, and C equals $\frac{1 - \sin\phi}{1 + \sin\phi}$. Since $K = w\frac{1 + \sin\phi}{1 - \sin\phi} = \frac{w}{C}$,

therefore $$Y = 2 \times \frac{wD}{C} = \frac{\left(\frac{wD^2}{C} - CwD_4^2\right)^2}{\frac{wD^3}{C} - 6Cw\left(\frac{D_4^2}{2}\right)\left(\frac{D_4}{3}\right)}$$

and $$\frac{2w^2D^4}{C^2} - 2w^2D_4^3D = \frac{w^2D^4}{C^2} - 2w^2D^2D_4^2 + C^2w^2D_4^4$$

whence $$C^4D_4^4 - 2C^2(D_4^3D - D_4^2D^2) - D^4 = 0$$

If D_4 be made equal to unity,
then $C^4 + 2C^2(D - D^2) - D^4 = 0$ . . . . . [29]

From this equation the diagram, Fig. 7, was obtained by substituting assumed values of D in decimals, which give the value of $\frac{D}{D_4}$, and solving for C.

DESIGN OF ANCHOR PILES FOR BULKHEAD WALLS

Another type of anchorage involving passive soil resistance is that of an anchor pile without a brace acting

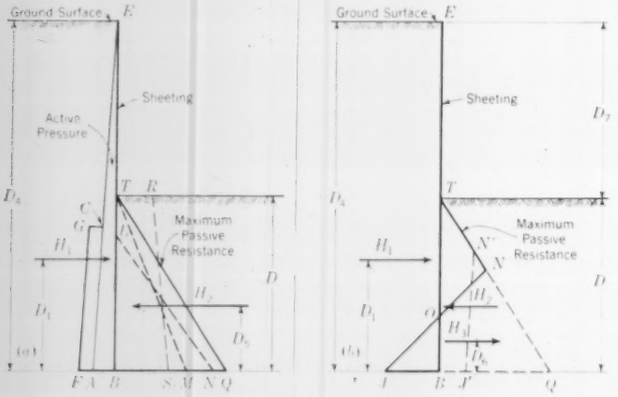

FIG. 6. FORCES ACTING ON SHEETING

as a support for vertical sheeting by resisting the pull of an anchor rod. Let $BRTQ$, Fig. 8, represent the total maximum possible passive resistance at the front of the pile. The additional passive resistance, $AFGQ$, as well as $A'F'G'Q'$ at the back of the pile will not be considered. Since these higher resistances of the original soil are neglected, and also because an anchorage pile may be allowed to tilt more than an exposed pole, which should regain its original position when released from the force acting on it, the maximum allowable back-kick for this case will be limited to $K(D + D_8)$. This is similar to the limiting value suggested for sheeting.

As the anchor pile does not extend to the top of the fill, the passive soil resistance in line with the top of the pile, K_T, is equal to D_8K, in which K is the passive soil resistance per foot of depth. Let H_1 represent the pull at the top of the pile; H_2, the passive resistance, MTQ; H_3, the pressure, represented by JNQ; and H_4, the passive resistance $BRTM$, which is equal to K_TD. Then, for lateral stability,

$$H_1 = H_2 + H_4 - H_3 = \frac{KD^2}{2} + K_TD - \frac{D_2Y}{2} \quad . \quad [30]$$

To resist rotation, $H_1D_1 = \frac{KD^3}{6} + \frac{K_TD^2}{2} - \frac{D_2^2Y}{6}$. [31]

From Equation 30, $D_2 = \frac{KD^2 + 2K_TD - 2H_1}{Y}$ . . [32]

and, $D_2^2 = \frac{(KD^2 + 2K_TD - 2H_1)^2}{Y^2}$ . . . . [33]

From Equation 31 $6H_1D_1 = KD^3 + 3K_TD^2 - D_2^2Y$

or, $D_2^2 = \frac{KD^3 + 3K_TD^2 - 6H_1D_1}{Y}$ . . . [34]

From Equations 33 and 34,

$$Y = \frac{(KD^2 + 2K_TD - 2H_1)^2}{KD^3 + 3K_TD^2 - 6H_1D_1} \quad . \quad . \quad . \quad . \quad [35]$$

Also, $$h = \frac{D_2[Y - (KD + K_T)]}{Y - KD_2} \quad . \quad . \quad . \quad . \quad . \quad [36]$$

In the calculations for the embedment of sheeting, the theoretical values for the passive soil resistance, based on either Rankine's or Coulomb's formula, may be used, employing the generally accepted values for the angle of repose of the various types of soil. For the passive soil resistance at the bottom of a pole, however, greater values may be assumed than could be

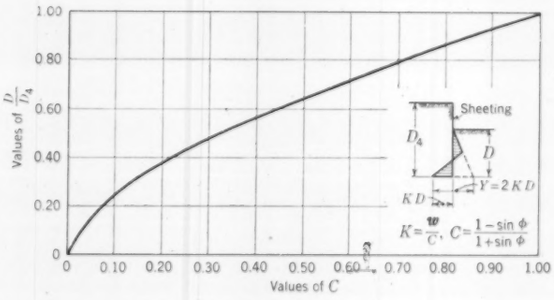

FIG. 7. DIAGRAM FOR EMBEDMENT OF SHEETING

obtained from a theoretical consideration of the angles of repose ordinarily used. This is evidenced by the large values of K that would be obtained from Equation 16, which is based on the experiments performed at North Carolina State College. The large values obtained for this constant may be attributed to several considerations: (1) The angle of internal friction of a virgin soil or a well-consolidated fill is much larger than the angle generally used. (2) Owing to the internal friction and cohesion of such a soil, when the pole presses against it the planes of shear are not parallel but diverge, thus engaging

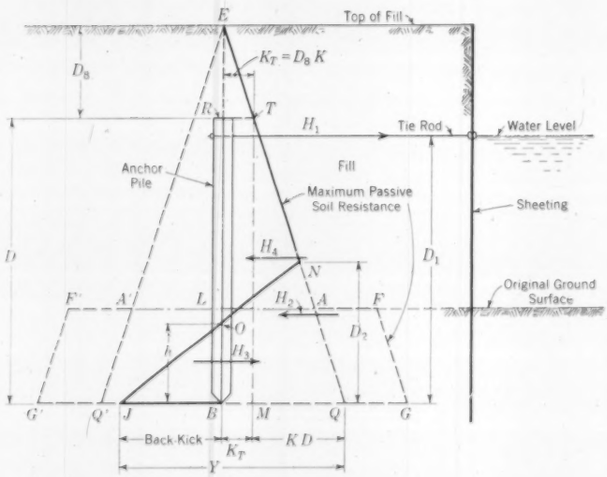

FIG. 8. FORCES ACTING ON AN ANCHOR PILE

more soil than that confined between parallel planes tangent to the sides of the pole. (3) Experiments show that soil behind a rotated pole remains practically vertical; thus no passive resistance value based on the angles of repose ordinarily assumed would be correct.

Art in Bridge Building

A Review of the Part Played by Both Engineers and Architects in Designing Notable Bridges

By HARRY J. ENGEL

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TAKING as his examples bridges that have been accepted as the most beautiful structures of their particular type, Mr. Engel in this article points out the features which distinguish them. He believes that bridges should be ornamented only to emphasize the design conceived by the engineer and that beauty is inherent to a properly and scientifically designed structure. For one of his examples he has discussed the masonry facing designed to cover the structural steel towers of the George Washington Bridge. The masonry facing in this structure was omitted as a measure of economy, but the opinion grows that the bare steel towers add to rather than detract from its beauty. The illustrations are from pen and ink drawings by the author.

WHEN the principles of architecture are applied to the design of a structure, the following factors are considered in order:

1. The background is taken into account; no design is considered that is inappropriate.

2. The design adopted is a unit, the parts of which must be in proportion.

3. Emphasis is placed on the function of the structure, and it is ornamented only with that in view. Put another way, this step in the composition is intended to dramatize the important features of the design.

In these three steps lie the essentials of good architectural composition, and it is singular how negative they appear when applied to the design of a bridge. The first two are definitely restrictive, tending to limit the types of design permitted, and the third points out that the engineering scheme adopted should be emphasized. It is hoped that the evidence to be submitted will stress the essential truth of this conclusion that the best appearing bridge is always the one in which the engineering solution is correct, the architectural treatment serving merely to emphasize the important features of the design.

MISCELLANEOUS EXAMPLES

At the risk of arousing disagreement, it will be suggested first that the Quebec Bridge over the St. Lawrence, a simple, practical structure, is at least majestic in appearance, and in the eyes of many bridge engineers takes on the quality of beauty. This bridge is the simplest of cantilevers, employing straight chords on the cantilever and anchor arms. Although curved chords might have been more nearly in agreement with the curve of the bending moments, the angular bearing between members of the curved chords in the first Quebec design was one cause of its weakness. The fact that the composition of the present design is sound is a reason for its attractiveness. It is a unified structure. Its divisions into a suspended span and sustaining arms are made clear, and the appearance of the K-web system agrees so well with that of the tapering arms that the effect of the diagonals, ordinarily a discordant note, is not here disagreeable. The Quebec Bridge is a forceful composition and is attractive as well as essentially practical.

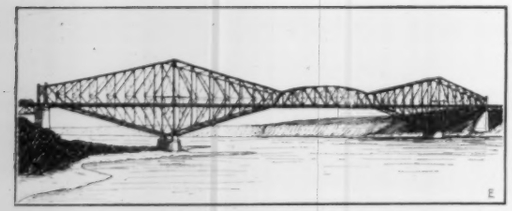
The other extreme of the scale is to be found in the Tower Bridge in London. This is an architectural fantasy inspired by its background, the dismal Tower of London, which stands near it on the north bank of the Thames. The bridge is an imaginative conception built around the idea of a castle with its moat. The two-leaf bascule, the braced-chain suspension side spans, tied together with a pedestrian footwalk, and the elevators within the towers connecting the deck with this footwalk are all ingeniously bound together. The towers consist of a steel framework masked with stone masonry. As an assemblage of all these factors into an architectural unit the composition is adroit; as a bridge it is artificial.

A better composition is to be found in the Rhine Bridge at Bonn. The setting here is more colorful than the one in London. A journey from Bonn in the direction of Mainz takes one through the castellated region of the Rhine Valley, where baronial ruins frown down from steep slopes on each side of the winding river. The bridge was designed in the knowledge that it was to serve as a gateway under which ships would pass en route to the most picturesque region of the Rhine, for the towers which ornament it are reminiscent of castles. But these towers are not masks of masonry like those of the bridge at London; rather they serve the useful purpose of stabilizing the piers against the differences in thrust between the arch spans. That is real composition.

Nearby Switzerland offers another type of setting for a bridge. There the scenery is wild, and cataracts are turbulent. In the far western part of the country the rugged stone Landwasser Viaduct carries the tracks of the Albula Bahn over a seething current in a picturesque gorge. In plan the bridge has a sweeping curve, but that is only an incident in its architecture. Nothing could be simpler or more direct than this viaduct, yet in its crossing of a striking chasm it presents a picture worthy of fine art.

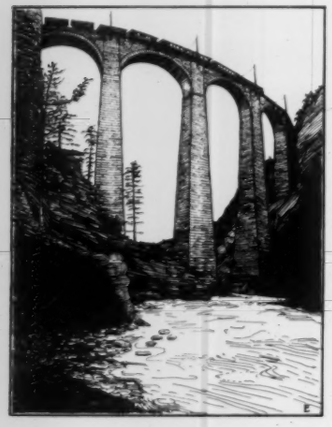
As the traveler enters France and approaches Paris, he comes upon the most consistently beautiful collection of bridges to be found anywhere in the world. Almost every one of the many small bridges that cross the Seine within the city limits is a work of art. Masonry bridges predominate, some of which, like the Pont Neuf, are relics of Renaissance architecture. But probably the most strikingly beautiful bridge in Paris is one of the newest, La Tournelle, a reinforced concrete stone-faced arch ornamented only with a tall shaft on which stands a statue of Ste. Genevieve, the patron saint of Paris. This composition is art in its simplest and most stirring form.

The drawing of modern La Tournelle with the flying buttresses of Gothic Notre Dame in the background suggests that the history of the arch will reveal something as to the value of architecture on the one hand, and engineering on the other, as they affect the beauty of design. It happens that France is a fertile field for such an inquiry, since it contains every important type of masonry arch bridge from the time of the Roman conquerors.

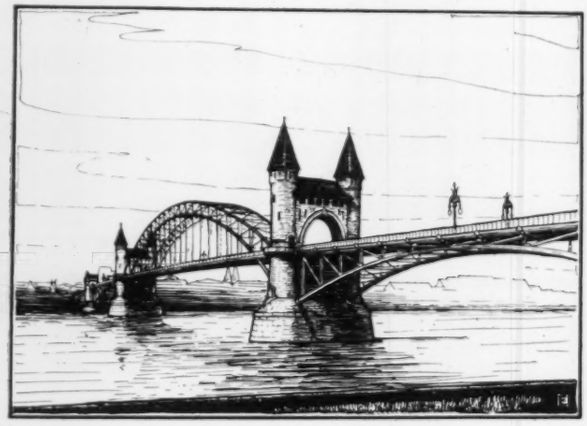


QUEBEC BRIDGE

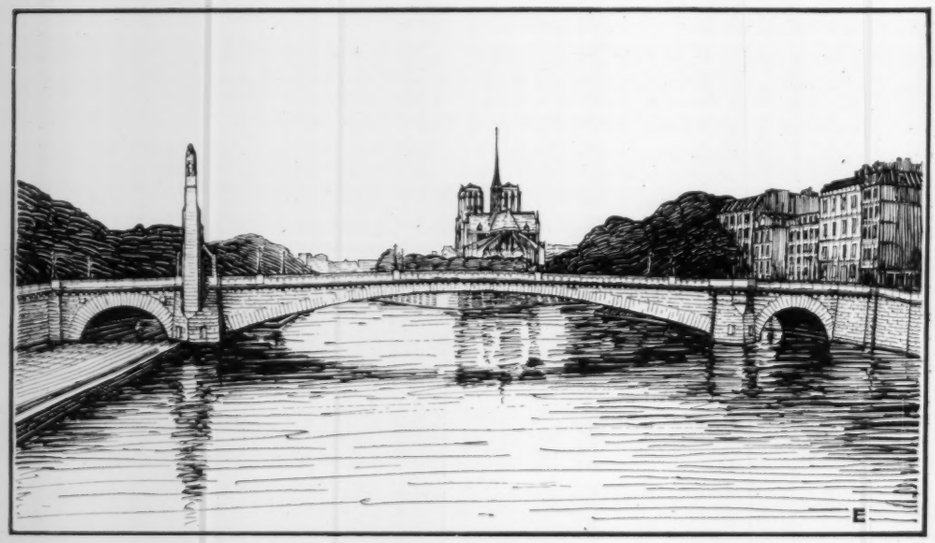
TOWER BRIDGE, LONDON



LANDWASSER VIADUCT, SWITZERLAND



BONN BRIDGE ON THE RHINE



LA TOURNELLE, PARIS

At Nîmes in the south of France stands the Pont du Gard, finest of the arched aqueducts which the Romans, master builders of antiquity, scattered broadcast over the extent of their empire. They had taken the idea of the arch from the Etruscans, an Asiatic band that besieged Rome at the time Horatius made his famous defense of the Tiber Bridge. Like all Roman arches, those in the Pont du Gard are semicircular, a shape no doubt adopted after a first attempt had indicated that such an arch with solid spandrels would stand up. The Pont du Gard has been widely praised for its beauty, but most of this praise has been directed at the effect of the stone masonry, and the magic of its endurance for twenty centuries, in wonder that the Romans could do so well. Certainly semicircular arches of only 80-ft span have not much to recommend them, even in point of beauty, considering what can be done today.

The Gothic arch, which followed the Roman type, is said to have been invented in Persia out of a desire to decrease the horizontal thrust on the foundations. Since the thrust was inversely proportional to the height of the arched opening, it could be decreased by merely pointing the opening upward. What this did to the arch itself was of course so damaging as to offset any incidental advantage at the foundations. Nevertheless, the pointed arch was used in many bridges, the famous Old London Bridge among them. The most notable example, however, is the Pont de Valentré, which is still standing at Cahors, France. This structure is a noble pile of masonry, bristling with fortifications in a manner typical of the troubled times in which it was constructed. However, its arches are only 54 ft in length of span, which is evidence enough of their inefficiency and of the retrogression in style from even the Roman type. When the Renaissance bridge builders returned to a curved type of arch, they chose the ellipse instead of the semicircle. But this was done entirely because the elliptical shape appealed to them, and because experiments indicated that an arch so shaped would stand up.

In 1716, the French Government organized its Department of Roads and Bridges, which was to be directed by men of broad scientific training. Perronet, one of the early directors, was presently creating original designs based in large part on reasoning and mathematics. For one thing he decreased the ratio of rise to span in the arch, and for another he showed that in multiple arches the dead-load thrusts balanced each other to the extent that narrower piers could be built than had been used. Engineering reasoning began to replace esthetic guesswork.

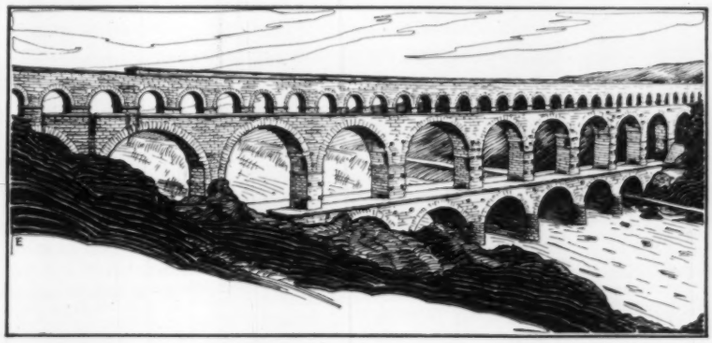
It was through the influence of this engineering method that the ribbed arch with spandrel columns was first attempted. It was used initially by Paul Sejourné in the Pont Adolphe at Luxembourg at the turn of the twentieth century. With its span length of nearly 280 ft, this arch

was outstanding among stone bridges, and at the same time set a new standard of beauty—a standard based on accurate mathematical analysis.

With the advent of reinforced concrete as an important construction material for arches, the type of design realized in the Pont Adolphe was used almost as a standard. Shadows were as a rule arranged in the same way, and the pattern was followed closely. However, in America the rigid-frame treatment has recently contributed a great many new ideas, while in France the influence of Freyssinet has resulted in a rebirth of originality.

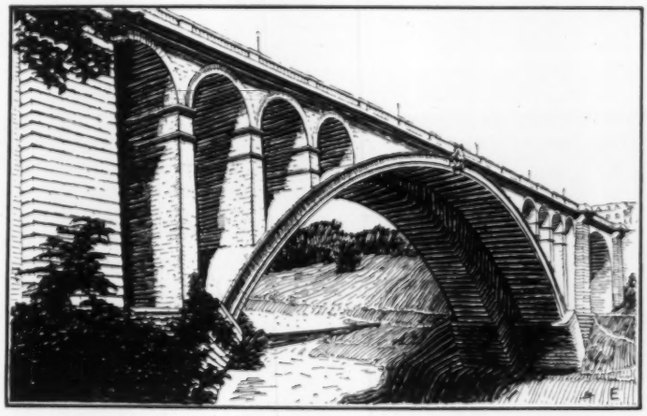
Some of Freyssinet's bowstring arches of reinforced concrete are hardly beautiful, but many of his designs for long spans completed by jacking at the crown are daringly attractive. Among bridges already built, this quality is best seen in the Pont Albert Louppe at Brest, of three 612-ft spans. Unquestionably it is a beautiful creation, although in comparison with the Pont Adolphe its design is even more completely of engineering origin.

Metal found its first use in an arch bridge in 1776,

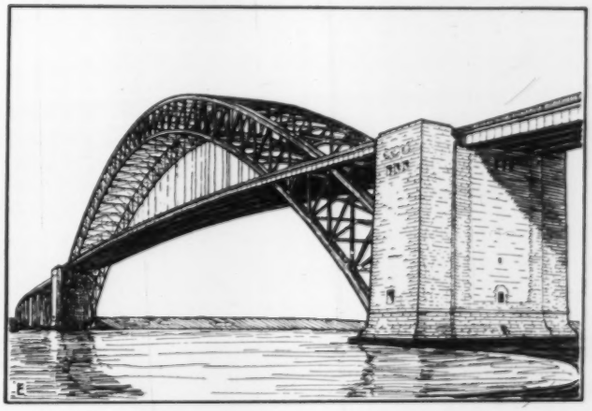


THE ROMAN PONT DU GARD, FRANCE

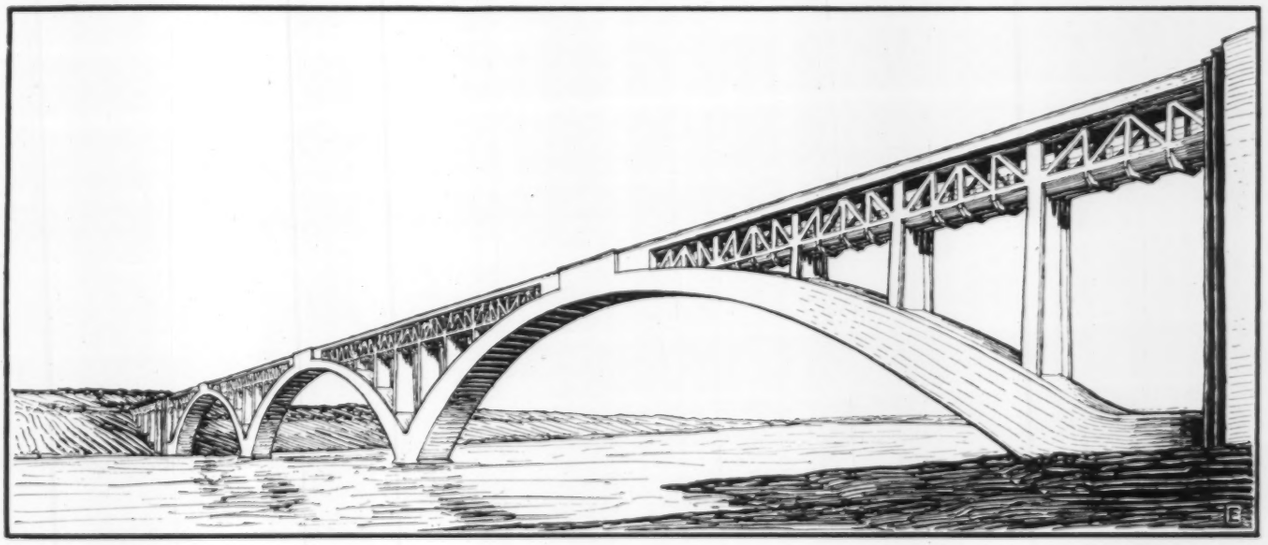
THE 14TH CENTURY GOTHIC PONT DE VALENTRÉ



PONT ADOLPHE AT LUXEMBOURG, 1903

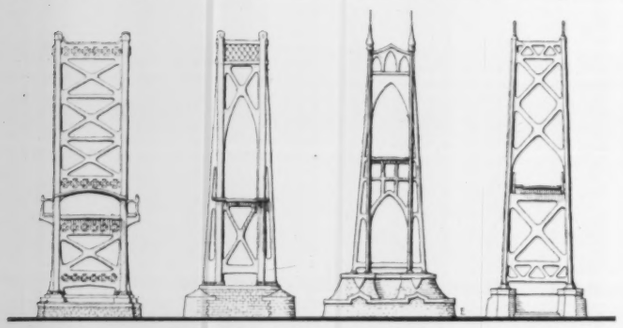


KILL VAN KULL ARCH, 1931



PONT ALBERT LOUPPE, 1931

when the 100-ft iron arch at Coalbrookdale was cast in England. In 1874, alloy steel was employed in the arches of the Eads Bridge in St. Louis, establishing the metal arch as a notable and agreeable type. The French Viaduc de Garabit, by Eiffel in 1884, illustrated the possibilities of the lenticular two-hinged arch, but the influence of the 1,000-ft Hellgate arch by Gustav Lindenthal, Hon. M. Am. Soc. C.E., completed in 1915, was much greater. The reverse curve of the Hellgate top chord was followed in the 1,650-ft Sydney Harbor arch bridge, opened in 1932. But the 1,652-ft Bayonne Bridge over the Kill Van Kull between Staten Island and Bayonne



Delaware River Bridge | Mid-Hudson Bridge | St. Johns Bridge | Davenport Bridge

STEEL TOWER DESIGNS

probably sets the real standard to be followed in the design of two-hinged steel arches, because it adheres closely to the parabolic shape suggested by stresses. This design by O. H. Ammann, M. Am. Soc. C.E., justly won the first prize of the American Institute of Steel Construction for the most beautiful steel bridge to be opened during 1931. The diagonal bracing of the arch trusses is not discordant, seeming to dwindle in size as it approaches the distant shore. When the masonry abutments with which the bridge was designed are in place it will offer a picture that will serve as a satisfactory climax to the history of arch bridges until perhaps the advent of the age of aluminum.

BEAUTY IN THE SUSPENSION BRIDGE

Within ten miles of the arch across the Kill Van Kull is Manhattan Island, surrounded by almost every type of steel bridge in use. Going up the East River and the Harlem, and thence down the Hudson, one encounters in succession three suspension bridges, a continuous cantilever, a suspension bridge under construction, a steel arch, a succession of swing spans, two high arch bridges, more swing bridges, and the world's longest suspension bridge. Of this array, the four completed examples of the suspension bridge illustrate pictorially the history of this type. Among them two stand out, the first and the last: Roebling's 1,595-ft Brooklyn Bridge, and the 3,500-ft George Washington Bridge over the Hudson.

The story of Brooklyn Bridge is well known. The late John A. Roebling, M. Am. Soc. C.E., had been trained as both architect and engineer. Although he knew little about modern intricacies like the theory of stiffening trusses, he approached each bridge, and particularly his masterpiece between Manhattan and Brooklyn, with a keen zest for accomplishment. His outstanding contribution was of course his use of parallel wire cables; in most other respects he enlarged on precedent. The Brooklyn Bridge was his greatest and last adventure.

When the bridge was opened in 1883 it became famous over the whole world and was pictured widely. Its stone towers, even though they did not flex with differential cable pulls, became recognized as significant monuments. In New York particularly they forecast the skyscraper era, and became indelibly associated with the growth of the city. When the Williamsburg Bridge was built, steel towers were used, but of stocky shape reminiscent of the stone design downstream. Only in the Manhattan Bridge was the influence of the older design lost—except perhaps in the Gothic portals at the tower tops. Here for the first time theory led to the type of slender tower that has since come to be recognized as most suitable for suspension bridges.

When the design of the George Washington Bridge over the Hudson was undertaken it seemed that the shadow of Brooklyn Bridge once again fell over suspension bridges, for masonry-faced towers were incorporated, intended to be monumental in appearance. However, they were to have a sustaining framework of steel.

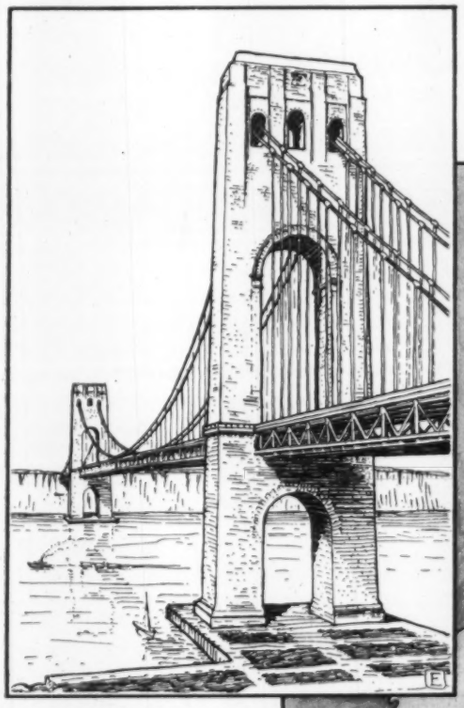
In 1931, the first stage of the bridge was completed, and it was opened without the masonry facing on the towers. It has since seemed inadvisable to incur the extra expense of adding the masonry. It is now admitted that the masonry facing probably never will be placed.

This situation has caused considerable discussion on the subject of beauty in bridge design. Opinion as to the appearance of the towers in their present state is almost equally divided, some holding that the many interlacing diagonals of the design give it a quality of machine-age beauty, while others regard it as unattractive. Perhaps the correct viewpoint is one of regret that the monumental towers were not completed as originally conceived, for it is not likely that the present extensive bracing would have been used had the towers been designed originally in steel without encasement.

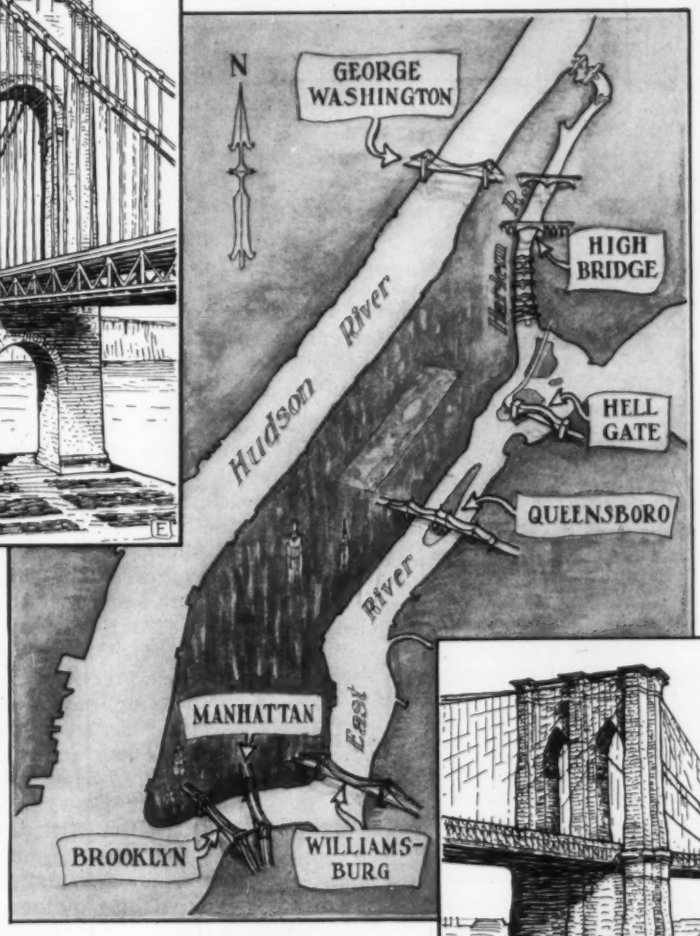
The development of steel towers has of course con-

DELAWARE RIVER BRIDGE

tinued. During the construction of the Delaware River Bridge, on which slender towers with diagonal bracing were used, Joseph Pennell made an etching of these towers with only the cables in place, commenting then that the design was ugly. Apparently the idea was too new and bold for this artist who had drawn masonry bridges without number and had made several studies of the London Tower Bridge with an apparently favorable reaction. In addition, he made the fatal mistake of not suspending his judgment until the roadway and stiffening trusses had been placed. The diagonal bracing of the towers harmonizes very well with the corresponding web system of the stiffening trusses—so well in fact that there is reason for reversing Pennell's opinion and classing this structure opened over the Delaware at Philadelphia in 1926 among the most beautiful of suspension bridges.



The George Washington Bridge as Designed



THE BRIDGES CONNECTING WITH MANHATTAN ISLAND

Brooklyn Bridge, Built in 1883

Another feature in the design of towers, the Gothic portal over the roadway, reappeared in the design of suspension bridges about the time of the building of the Mid-Hudson Bridge at Poughkeepsie, N.Y., opened in 1930. Since then, the Gothic has been made the dominant motif in the towers of the St. Johns Bridge at Portland, Ore., completed in 1931. Here some appropriateness is lent to the spires on the tower tops by the pointed terminations of the evergreen trees which abound nearby. Very often, however, the expense of such ornamental treatment renders it prohibitive, and recourse must be had to a design involving diagonal bracing. Such a simple but effective treatment, assembling as well as possible the virtues of previous designs, is to be found in the towers of the Davenport Bridge, now being built over the Mississippi between Bettendorf, Iowa, and Moline, Ill.

At other locations a rigid-frame treatment of steel towers is being used, as in the Golden Gate Bridge at San Francisco. On the whole one fact is certain—slender steel towers for suspension bridges are the most beautiful now known to the profession and can be shaped in any number of attractive ways.

From this study of notable bridges it may be concluded that increasing beauty has always come as a result of engineering advances, and that what ornamentation has been adopted satisfactorily has always tended merely to emphasize the design conceived by the engineer. That is to say, where the engineer has arrived scientifically at a method of design which has proved practical, the collaborating architect has contributed to its beauty only when his efforts have lent significance to this phase of the achievement.

This conclusion can be of value in one very practical way. As part of the recent esthetic movement, art commissions have been appointed in various places to pass on the attractiveness of bridge designs submitted in their territory. This is a praiseworthy step so long as the art commission confines itself to that function and rules out designs that are objectionable from the standpoint of proportion or obvious crudeness. However, these commissions not only pass judgment, but also have authority to dictate the type of the final design and sometimes do so. Such dictation on the part of the architect in bridge design is out of place. Any design of true beauty must necessarily originate with the engineer, leaving the architect only in the rôle of collaborator, contributing to the attractiveness of the engineer's creation.

CORNELL CRESCENT, DESIGNED LARGELY FROM THE STUDY ILLUSTRATED IN FIG. 1

Influence of Loci on Engineering Design

A Study of the Principles of Moving Objects Modifies Many Structures

By GAVIN HADDEN
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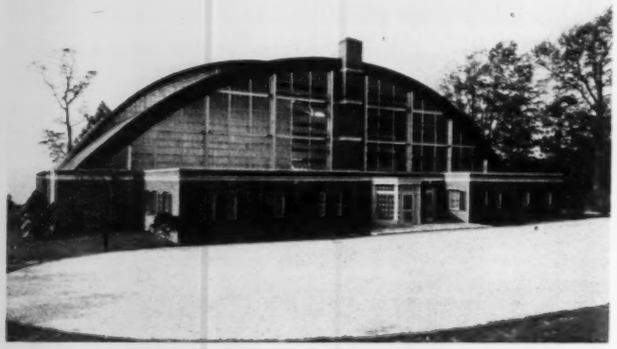
CIVIL ENGINEER, NEW YORK, N.Y.

LOCI have been defined as "surfaces or curves regarded as traced by lines or points moving under specified conditions." Consciously or unconsciously, they influence the designers of engineering or architectural works. The location of the floors and ceilings of any building may be largely determined by the loci of the moving heads of the persons who will use it; the depth of a channel may be determined by the loci of the keels of the ships for which it is planned; the curve of a highway or a railroad may be determined by the locus of a moving vehicle at a predetermined speed; the treads and risers of a stair are fixed by the loci of persons' feet in easy ascent.



COVE NECK TENNIS COURTS, NEAR OYSTER BAY, N.Y.
A Trajectory Type of Building Based on a Study of the Flight of Tennis Balls

These are just a few of the simple and common examples of the influence of loci that are developed by the purposes or uses of various works. A more complicated example is found in streamlining, to which so many designers recently have been turning their attention. The loci of particles of air or water in passing moving objects have a vital influence on the design of cars, planes, and ships.

In the definition of loci previously given, the occurrence of the word "curves" is perhaps particularly significant. Although technically a straight line may be regarded as merely a certain kind of curve, the fact remains that many loci are curved lines or curved surfaces according to the common meaning of the words. Therefore, designs that are influenced by loci should often result, logically and practically, in curved forms.

The accompanying diagrams and pictures demonstrate three examples of curved forms developed in the writer's office. These forms have resulted logically and practically from the application of the theory of loci—three examples that are totally different in character and purpose. It is almost inevitable that the application of this theory should produce results which are inherently economical and efficient. When, as sometimes occurs, the form dictated by loci happens to be also a form that is structurally efficient, then its advantages are much increased.

APPLICATION TO SPECIFIC PROBLEMS

In Fig. 1 the shaded area is typical of the results of a number of observations. It represents in plan the area of seats on one side of the field naturally chosen by those attending a game in a large stadium.

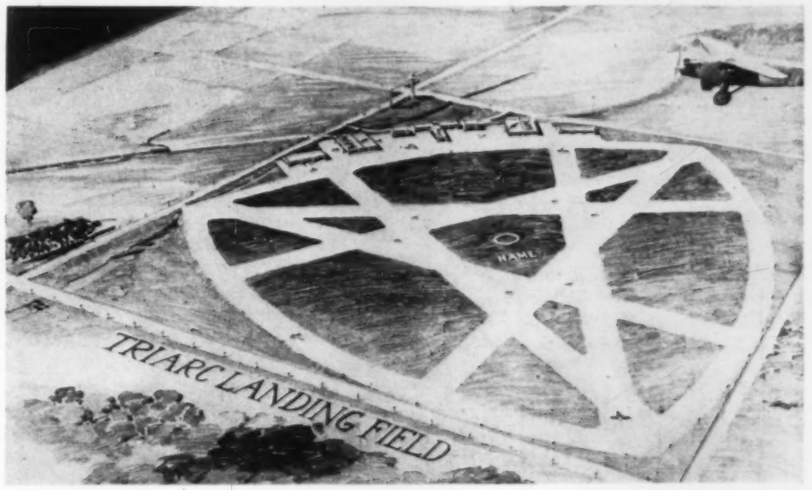
In this study the spectators had no seating restrictions and hence the area chosen from the seats not previously occupied represented their natural preferences regarding the most desirable locations. The upper limit of this area approximates a circle centered on the center of the gridiron, and this is the outer locus of the desirable seats for a given number of spectators. The heavy lines of Fig. 1 represent in plan the seating deck of a stadium of the type of the Cornell Crescent in Ithaca, N.Y., the design of which was largely based on a study of loci.

An ideal design for a landing field will permit the construction of the longest possible runways in every direction of the compass, at the same time reducing the area required to the minimum. In Fig. 2 it is shown how the locus of the runways satisfying these conditions is determined for a square site, resulting in a triangularly symmetrical figure composed of three intersecting arcs, each of radius equal to the side of the square. The design of the "triarc" landing field was based on the principle of loci. A perspective drawing shows a typical design as seen from the air, with six paved runways symmetrically placed.

Another diagram, Fig. 3, shows a side view of the lines of flight of a tennis ball during two rallies that were identical except for end-for-end reversal of the strokes, these rallies including several unusually high lobs and bounds.

Thus the area occupied by the lines of flight represents in longitudinal section the locus of the tennis ball during play. Enclosing this area is the longitudinal section of a tennis court building of the "trajectory" type, the design of which was largely based on a study of loci. One of the photographs shows a finished building of this design.

Similar methods may be used in approaching a wide variety of engineering problems. Those cited here have obvious solutions and have been patented by the writer. Other problems are more intricate, but nevertheless the basic principles are simple in themselves and will yield results that are both logical and economical.



PERSPECTIVE DRAWING OF A COMPACT LANDING FIELD ON A SQUARE PLOT
As Determined by Loci Such as Shown in Fig. 2

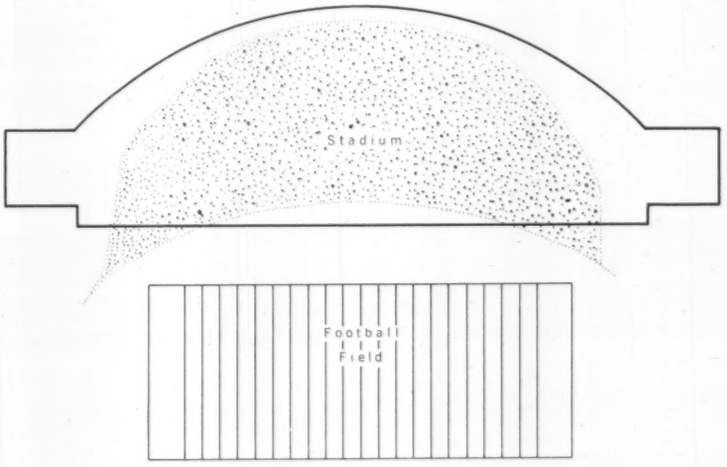


FIG. 1. SPECTATORS' CHOICE OF SEATS AT A FOOTBALL GAME

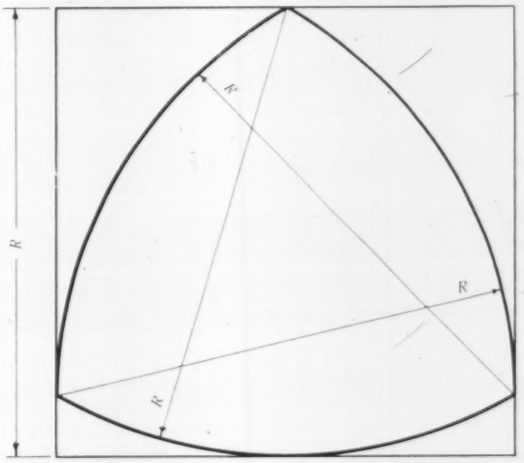


FIG. 2. AN AIRPLANE LANDING FIELD ON A SQUARE PLOT

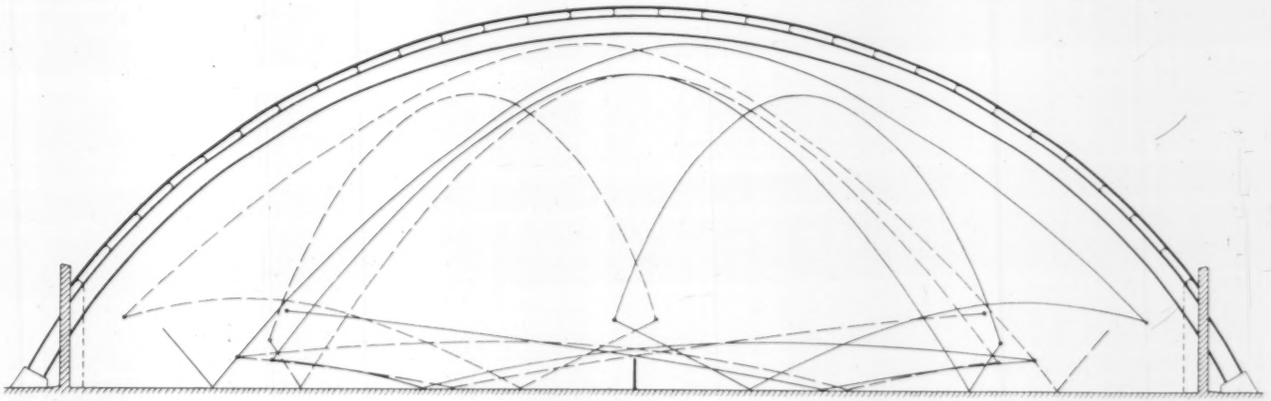


FIG. 3. LOCI OF THE FLIGHT OF TENNIS BALLS

A Half Century of the Skyscraper

Tracing the Expansion and Refinement of a Brilliant American Achievement

By Robins Fleming

American Bridge Company, New York, N.Y.

IN this article Dr. Fleming extends his studies into the history of that fascinating structure, the skyscraper. His article in the October issue, which was in the nature of an anniversary greeting to celebrate fifty years of skyscraper construction, should be studied to give the proper setting. The new industry grew rapidly after its auspicious start in 1884, and before the turn of the century notable structures had arisen both in Chicago and New York, each succeeding one surpassing its predecessors in height or in advanced engineering features. There were two peaks in this important tendency: the first in the years from 1907 to 1913, and the second during the boom period about 1930. In the meantime the popularity of the skyscraper has extended across the country and, to a less extent, throughout the world. But America still holds its preeminence in this field. Because the present marks a noticeable lull in the continuous development of the skyscraper, Dr. Fleming's article is especially timely as a review and a reappraisal of an epoch-making American art.

THE skyscraper is America's contribution to architecture. The term is relative, and its meaning depends largely upon the city in which it is located. A 10-story building in a small city conveys as great a sense of height as a 20-story building in New York or Chicago. It is, however, a common practice in compiling lists of skyscrapers to include buildings of 10 stories. In this article the term will be limited to buildings of skeleton construction.

SURVEYING THE FIELD

In the July 1929 issue of their publication, *The Skyscraper*, the Thompson Starrett Company, Inc., stated as the result of a survey that there were 4,778 buildings in the United States ten or more stories in height. Corrections in the list added 90 to the number. At present (December 1934) the estimate may safely be put at over 5,000. Of these more than half are in the City of New York, about 500 are in Chicago, and the remainder are located in 40 or more cities. It should be noted that the survey included reinforced concrete buildings as well as those of skeleton construction. No distinction was made.

According to a survey made by the Portland Cement Association, corrected to January 1, 1930, there were 773 reinforced concrete buildings in the United States and 27 in Canada of 10 stories or more in height. Of these the highest in the United States is the Master Printers Building, in New York. This 20-story structure, which was erected in 1926–1927, measures 299 ft from ground level to the top of the tower and 310 ft to the top of the concrete chimney. Sterling Tower, an office building in Toronto, Canada, built in 1928, extends 21 stories, or 254 ft, above the sidewalk level. The highest reinforced concrete building in the world is the Hotel Palacio Salva in Montevideo, Uruguay. The tower part of this 28-story structure, which was built in 1925–1926, extends 338 ft above ground level. There are also two basement stories.

THE SKYSCRAPER IN CHICAGO

Development of the skyscraper can be traced through a number of historic structures erected in Chicago. Qualified committees have decided that the Home Insurance Building, begun in 1884 and occupied by tenants in 1885, is entitled to be called the world's first skyscraper of skeleton construction. I went into this matter in some detail in my paper, "Whence the Skyscraper," in the October number. The Home Insurance Building was originally 10 stories in height, but two more floors were added in 1890–1891. After an existence of 47 years this structure, along with buildings on adjoining sites, was wrecked in order to give way to the Field Building, the center part of which is 42 stories, or 535 ft in height. This structure, which was formally opened on April 28, 1934, made available 1,000,000 sq ft of rental space. A period within the span of a single life thus marks the origin and development of the skyscraper. In view of the present cessation in the erection of high buildings for commercial purposes, some competent authorities think it fitting to call the past fifty years "the skyscraper era."

Next came, as the second structure or skeleton construction, the 14-story Tacoma Building, erected in 1886–1887 and demolished in 1929. Its outer walls on the two street fronts were purely curtains of brick and terracotta, carried at each floor by steel spandrel beams and cast-iron lintels attached to cast-iron columns. For the first time in history the building of walls was commenced at different levels. A startling spectacle was seen—bricklayers beginning to lay walls midway between roof and ground. The Tacoma Building was the first structure in which outer walls carried no burden and served no purpose other than that of ornamentation and keeping out the elements. Because of this fact many engineers accord to this building the honor of being the first skyscraper.

Another building erected about this time had unique features of great engineering import. The 12-story Rookery Building, which was constructed in 1885–1886, has been called "one great pile of marble and glass and tiling." This structure was fireproof with rolled beams and cast-iron columns, but it had no columns in the exterior walls. According to William L. Jenney, "The Rookery claims the honor to be the first to use steel foundations"; and the late Colonel Starrett wrote that, "the foundations pioneered the present steel-grillage beams."

Still other Chicago structures were noteworthy. The Rand-McNally Building, erected in 1889, was the first large structure in which steel columns were employed throughout. The Leiter Building, designed soon after this by Jenney, was the first in which there was not even one self-supporting wall. The Fair Building, also designed by Jenney and built in 1891, was the first to employ Z-Bar columns. The Reliance Building, constructed in 1894, was the first to use terra-cotta exclusively in curtain walls. The columns were of the "Gray" type—a form that has since passed out of use. A member of the editorial staff of *Engineering* (London) published a description of this building in the Nov. 2, 1894 issue.

Someone gave an early description of the Masonic Temple as, "twenty-one stories of steel on floating spread foundations, the highest building in the world, and one of the wonders thereof for the next few years." When completed in 1892 it was indeed the highest building in the world, measuring 272 ft 10 in. from grade to top of coping. Spread footings with four courses of steel rails were used for foundations. The Masonic Temple, which was a bold piece of work, may be said to have ended the experimental era. It illustrated the possibilities of steel skeleton construction.

By this time in Chicago an impetus for high buildings had set in. Offices in the new skyscrapers were in great demand. The Wrigley Building, constructed in 1913, was one of the first in this new era. The Stevens Hotel, with its 3,000 rooms, was when built, in 1927, the largest hotel in the world. The Daily News Building, erected in 1929, was the first large building in Chicago to be constructed on "air rights." The Mather Building and Tower, built in 1927, is a slender 18-story tower, 256 ft high, surmounting a 24-story office building, 265 ft high. The tower is made conspicuous by the walls of gleaming white terra-cotta with elaborate decorative treatment.

Worthy of special mention is the 34-story Tribune Building, with a wing of 20 stories. The design for this structure won the award in a competition in which architects from all over the world took part. The building was completed in 1925. In 1930 the Merchandise Mart was finished. This building, with its 18-story main structure and 25-story tower section, has a floor area of more than 4,000,000 sq ft, placing it in size far ahead of any other commercial building now in existence (1934). The site of the building is that of the former passenger station of the Chicago and Northwestern Railway. The project involved the largest development of air rights yet undertaken. The Board of Trade Building, 44 stories in height, was opened on June 9, 1930. Its tower, extending 612 ft above the street level, made it the highest structure in Chicago. *The Chicago Daily News Almanac and Year Book* for 1934, under "High Buildings in Chicago," lists 97 as having 20 stories or more. Of these, nine are 500 ft or over in height.

Although the type of building known as the skyscraper had its origin in Chicago, as already briefly recounted, it has arrived at its greatest development in New York City. Coming into the harbor by steamer or crossing the river by ferryboat, one sees a skyline equalled by no other city in the world.

Precedence as the first building of skeleton construction in New York City belongs to the Tower Building on lower Broadway, completed in September 1889. The architect was Bradford Lee Gilbert. This structure of 10 stories, basement, and cellar, had a width of $21\frac{1}{2}$ ft on the front, and $39\frac{1}{2}$ ft on the rear and was about 100 ft deep in the narrow portion. From the sidewalk to the main roof the height was 129 ft. The walls and floors were carried entirely by the metal framework, and the columns were of cast iron. Considerable difficulty was encountered in obtaining the approval of plans by the building department, as there were doubts regarding the safety of the proposed structure. The claim that this building was the "earliest example" of skeleton construction, as stated on a tablet placed on the structure, has been vigorously denied. It seems to me that Gilbert is entitled to recognition for taking an advance step in the evolutionary process of skeleton construction rather than to credit for being its originator. The building was demolished in 1914 to give place to a higher structure.

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HOTEL PALACIO SALVA, MONTEVIDEO, URUGUAY
World's Tallest Reinforced Concrete Building

THE TOWER BUILDING, NEW YORK'S FIRST SKYSCRAPER
Built on Broadway near Exchange Place in 1889 and Demolished in 1914. From a Photograph Taken About 1895 and Obtained Through the Courtesy of the New York Historical Society

Strange as it may seem, the first skyscraper of note in New York City is still standing. This is the Manhattan Life Insurance Building, which is 67 by 120 ft in plan and 17 stories high with a tower on top terminating in a dome. From its sidewalk on lower Broadway to the base of the flagstaff the elevation is 347 ft. At the time of its construction (1893–1894), the building was the highest in New York City—60 ft higher than Trinity Church, across the street. A unique feature in its construction was the employment, for the first time in building work, of pneumatic caissons sunk by means of compressed air.

Other structures of note soon appeared. A contest in building skyward arose. New York rivalled and then surpassed Chicago in the construction of lofty buildings. In the early part of 1899 came the 26-story St. Paul Building, followed a few months later by the 30-story Park Row Building, each in turn being the highest office structure in the world. Also mention may well be made of the famous Flatiron Building,

now called the Fuller Building, erected in 1902 on a lot that was nearly the shape of a flatiron.

In 1907 four record-breaking buildings were in process of construction at the same time: the Terminal Building, the Metropolitan Tower, the Singer Building, and the City Investing (now the Bensenson) Building. The 41-story Singer Building, with a four-story lantern on top of the tower, rose to a height of 612 ft, making it the highest office building in the world. The 48-story tower of the Metropolitan Life Building, finished later, reached a height of 658 ft and thus won the crown—but only temporarily.

In 1913 came the Woolworth and the Equitable buildings, the records of which for height and size have only recently been broken. The Woolworth Building, formally opened on April 24, 1913, is probably the best known office building in the world. It has offices in the fifty-third story of the tower portion. The observation gallery is 58 stories above the street, and the base of the 22-ft flagpole is 760 ft 6 in. above the curb.

The 36-story Equitable Building has a distinction of its own. Its ground plan is carried undiminished in area to the top, covering an entire block of an average width of 159 ft and average length of 308 ft. It rises to a height of 542 ft from the Broadway sidewalk to the coping. Its rating on the New York assessment roll of 1934 for taxes is placed at $29,000,000, making it second to the Empire State Building, which is rated at $32,000,000. The Waldorf-Astoria heads the list of skyscraper hotels with a rating of $23,000,000.

ZONING PROMPTS SET-BACK SKYSCRAPERS

No measure of building legislation enacted during the existence of the New York City Bureau of Buildings has been more important than the Building Zone Resolution adopted July 25, 1916. It set a limiting height along the street lines for office buildings but provided that for each foot that the building, or a portion of it, is set back, a certain number of feet shall be added to the height limit.

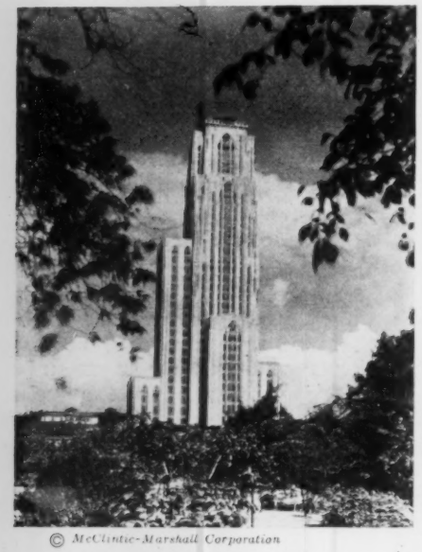
It was expected that this regulation would act as a curb to the building of skyscrapers, certainly to the building of super-skyscrapers. Such has not been the case. The number of monumental buildings that have been erected since that time is bewildering. Although not a skyscraper, the Roxy Theater, completed in 1927, is "the largest and most elaboratory equipped theater in the world." The great Madison Square Garden, 200 ft by 575 ft, has 17,000 seats around an oval that commands an unobstructed view from all parts of the auditorium.

In 1929, after 15 years, the Woolworth Building lost its supremacy of height. Both the Chrysler and the Bank of Manhattan buildings, completed that year, are higher. Even they, however, were soon surpassed by the Empire State Building, the highest of all structures reared by man, which was formally opened on May 1, 1931. From the street level to the main roof of the tower portion the distance is 1,045 ft 8 in. This part of the building is surmounted by a mooring mast, or lesser tower, 204 ft 8 in. high, making a total height of 1,250 ft from the street level to the tip of the mooring mast. The upper observation gallery (on the 102d floor) is 1,224 ft $2\frac{1}{2}$ in. above the street level. The building covers a ground area of 83,000 sq ft and contains 1,921,811 sq ft of rentable floor area.

Rockefeller Center, extending over three blocks in the midtown area, is the largest commercial enterprise ever undertaken by private capital. The 70-story RCA (Radio Corporation of America) Building, with a height of 850 ft, is the dominant vertical note of the development. This structure, which was erected in 1933, has a rentable floor area of more than 2,000,000 sq ft. The Radio City Music Hall, another part of this same development, was opened to the public on the evening of December 27, 1932. It will seat 6,200 as compared with the Roxy Theater's seating capacity of 6,000. As in the case of the Roxy Theater, there are no columns within the seating area.

In its 1934 edition, *The World Almanac and Book of Facts* lists 39 buildings in New York City that are more than 500 ft in height. Of these, five are higher than the Woolworth Building.

Chicago and New York did not long remain pioneers in the field of skeleton construction. In Detroit, for instance, there are a number of skyscrapers. The Greater Penobscot Building, erected in 1928, is the highest structure in the city. It has 47 stories and measures 565 ft 2 in. from curb to top of roof and 666 ft 6 in. to top of beacon tower. The 40-story Union Trust Building, constructed in 1929, comes next with the top of the tower



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CATHEDRAL OF LEARNING
University of Pittsburgh

© *New York Telephone Company*

THE NEW YORK TELEPHONE BUILDING
140 West Street, New York, N.Y.

© *Moore Dry-Dock Company*

SHELL OIL BUILDING, SAN FRANCISCO
380 Ft High

parapet 486 ft 6 in. above the sidewalk. The Fisher Building, a business, shopping, and amusement center, rises to a height of 440 ft. It was built in 1928. When finished in 1931, the General Motors Building, which is 15 stories, or 220 ft high, rivaled the Equitable Building of New York in extent of floor space, the rentable area being 1,100,000 sq ft. *The World Almanac* for 1934 lists 19 buildings in Detroit that are more than 200 ft high.

In Cleveland there is the Cleveland Terminal Tower and Union Station, constructed in 1928–1929. The 52-story tower of this remarkable structure covers a ground area of 71,527 sq ft and rises to an extreme height of 708 ft. The 21-story Union Trust Building has nearly 1,000,000 sq ft of rentable floor area. Passing farther south to Columbus, there is the 48-story building of the American Insurance Union, built in 1927. This building, which is 555 ft high, is of interest to the structural engineer because of the meticulous attention given to wind bracing.

A notable building in Cincinnati is the 48-story Carew Tower, covering an area of 85,250 sq ft and having a rentable floor area of 890,700 sq ft. The height from curb to top of roof is 568 ft 6 in. and to extreme top of structure, 574 ft. This improvement includes department stores; a 25-story automatic elevator garage; a 28-story, 800-room hotel; and a 48-story office building. The short time required for erecting a building of such diversified interests is worthy of note. Foundations were started January 1, 1930; a department store opened for business in October; the office building was ready for tenants on November 1; the hotel opened January 28, 1931; and the garage was ready on February 10.

Unique among Pittsburgh skyscrapers is the "Cathedral of Learning" of the University of Pittsburgh. This monumental shaft rises 40 stories to a height of 510 ft above the ground. In Philadelphia the highest office building is the 33-story Philadelphia Savings Fund Society Building, which was constructed in 1932 and is noteworthy for its novel architectural and engineering features. The banking room on the second floor, 130 ft long and 60 ft wide, is spanned by trusses that carry 30 stories of the building. Baltimore has the Emerson Tower, 357 ft high. And New Orleans has two bank buildings, 22 and 23 stories high, respectively.

In Winston, N.C., there is the 23-story Reynolds Tobacco Building, constructed in 1929. It is surprising to find such a high building in such a small city. A near parallel is Tulsa, Okla., which boasts the 28-story Exchange Building and the 23-story Philtower. At the time of the 1926 hurricane, Miami, Fla., had a dozen or more buildings of the skyscraper class. Two of these suffered severely during the storm because of inadequate wind bracing. The 19-story office building of the Dallas Power and Light Company, in Dallas, Tex., is the highest welded building yet constructed. In this structure both field and shop connections, except those necessary for the fabrication of three large plate girders, were arc-welded. Steel erection started July 18, 1930, and was completed six weeks later.

It was the life ambition of W. B. Foshay to have a structure in Minneapolis with "battered" columns tapering the building as in the case of the Washington Monument. This ambition was fulfilled with the completion in 1929, of the Foshay Tower, "the tallest and most unusual office building in the Northwest," which measures 450 ft from the street to the peak of the pyramidal roof

In San Francisco the half-dozen skyscrapers in order of height, according to the Building Department, are: the Russ Building, 408 ft; the Shell Oil Building, 380 ft; the Pacific Telephone and Telegraph Building, 368 ft; the Medical Dental Building, 346 ft; the Standard Oil Building, 327 ft; and the William Taylor Hotel, 310 ft. These buildings are noticeable for features other than height and size.

Before leaving the cities of the United States, it must be said that the foregoing survey is by no means complete. Important buildings as well as those possessing unique features have not been mentioned. For instance, the home office of the Aetna Life Insurance Company in Hartford, Conn., opened January 1, 1931, is the largest of its architectural type (New England Colonial design) in the world. In the same city is the office building of the Travelers Insurance Company, the tower portion of which reaches a height of 527 ft. The upper stories of the Dade County (Florida) Court House and Miami City Hall are occupied by the jail, while a basement under the terrace surrounding the building serves as a garage for the cars of the officials.

In Canadian cities, especially Montreal and Toronto,

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WALDORF-ASTORIA HOTEL, NEW YORK
Assessed at Twenty-Three Million Dollars

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WRIGLEY BUILDING, MEDINA ATHLETIC CLUB, AND TRIBUNE BUILDING IN CHICAGO

© *Hamilton Bridge Company*

CANADIAN BANK OF COMMERCE, TORONTO
Tower 475 Ft Above Street Level

the skyscraper is familiar. The Royal Bank Building of Montreal, finished on June 13, 1928, was the highest commercial building in the British Empire. It measured 393 ft from grade to the top of its lantern. In a year, however, the supremacy passed to the 28-story Royal York Hotel of Toronto, measuring 376 ft 2 in. from street level to the top of roof ridge and 399 ft 2 in. to top of chimney. Since then the Canadian Bank of Commerce, the tower of which rises to a height of 475 ft above street level, was constructed. Vancouver, at the other end of

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MERCHANDISE MART, CHICAGO
The 4,000,000 Sq Ft of Floor Space in This Structure Make It the Largest Building Yet Constructed

the Dominion, and Winnipeg also have their quota of tall buildings. Regina has two 12-story buildings. The Palisses Hotel in Calgary, Alberta, rises to 10 stories, and the Banff Springs at Banff, Alberta, to 13 stories. The Chateau Frontenac, in Quebec, is 17 stories high.

The first skyscraper of Mexico City is a structure of 13 stories, designed to withstand earthquake shocks. The construction is of more than usual interest, owing to the foundation conditions. As is well known, Mexico City is located on the bed of an ancient lake. By digging down only 4 or 5 ft water level is reached. Building loads are thus carried on a thin surface strata, and variations in the character of the soil and the loads placed on it cause unequal settlement. A special type of foundation for large and heavy buildings in this region was devised by J. A. L. Waddell, M. Am. Soc. C.E.

In London skyscrapers are barred. The building code does not permit office buildings to be more than 80 ft in height. Some cities in England follow the London Code; others do not. One office building in Stockholm is 14 stories high, and there are still other skyscrapers. The 12-story "Chile House" in Hamburg has been called the "largest and tallest building in Germany." A banking house, known as "the first real skyscraper on the Continent," has been built in Antwerp. The main building has 12 stories, and the tower 28, so that the total height is 390 ft. In Warsaw there is a 16-story apartment house that is shop-welded and field-riveted. In his book, *The Native's Return*, Louis Adamic mentions a 12-story *nebotichnik* (skytoucher) being erected in Lublyana, a city of 75,000 inhabitants in Yugoslavia. Madrid has a high telephone building, and Buenos Aires and Santiago, Chile, also have skyscrapers. "All Australia," says a bulletin of the National Geographic Society, "took sides in the recent Melbourne controversy over a petition to build a 40-story building. Melbourne, like Washington, has thus far kept within the 13-story limit." It is of interest that the petition was refused—this was in 1926. Shanghai can boast of the two highest buildings in Asia—the Foreign Y.M.C.A. Building and the Robert Dollar Building, each of which is 10 stories high.

TRENDS OF DEVELOPMENT

From this brief survey it is seen that the trend of office buildings has been to greater and greater height. Likewise, there has been a wonderful advance in beauty over the early rectangular, box-shaped structures. The Woolworth Building, the New York Life Insurance Building, and the New York Telephone Building, in New York; the Daily News and Tribune buildings, in Chicago; and a score of other structures are triumphs of architectural design.

A decided development has taken place in the structural features of the skyscraper. The cast-iron columns of the first skyscrapers, sometimes used in buildings of 17 stories, have long been out of date. Steel had largely taken the place of cast iron when the Darlington Apartmet House, a 13-story building in New York, collapsed on March 10, 1904, during the process of erection. Square cast-iron columns had been used throughout the structure, and to lack of lateral support of these columns was attributed the main cause of the collapse. This disaster acted as a deterrent to the further use of cast-iron columns in high buildings. It is hard for the structural engineer of today to understand the hold maintained by the cast-iron column so long after steel had come into general use. Although able engineers had pointed out objections to it, the advocates of cast iron claimed points of superiority. Probably the real reason for its use, however, was that the foundry interests were strong and did not care to lose their market.

Skyscraper design is largely governed by the building code of the municipality in which it is located. This code may be a hindrance to its development. For instance, the New York code in force before 1916 specified that brick enclosure walls between iron and steel columns, supported wholly or in part on iron or steel girders, must be not less than 12 in. thick in the upper 75 ft of the height, and in each 60-ft section below this, 4 in. thicker than in the section next above. For high buildings this clause places an unnecessary cost upon the owner because of the additional brick and steel required and the loss in rental area due to the decreased floor space. There is no gain in lateral stability, because the walls are cut up by windows where stability is most needed. Moreover, lateral and wind forces should be resisted by the steel frame. The engineer who designed the Hotel McAlpin, in New York, estimates that 800 tons of steel could have been saved had it not been for this foolish requirement. The present New York code allows masonry walls supported by girders to be 12 in. thick for the entire height of the building.

WHAT OF THE FUTURE?

In its 1934 edition *The Chicago Daily News Almanac* lists office space vacant as of January 1, 1933. For New York, Chicago, Philadelphia, and Detroit the figures are respectively 21.3, 25.5, 31.5, and 38.1 per cent. During the succeeding two years these percentages have slightly increased. It is hardly probable that more high buildings will be constructed until a marked percentage of these vacancies is filled. How soon this will be, or under what economic conditions new office buildings will be erected, is a matter of speculation. Let it suffice to predict that the day of the super-skyscraper is over.

Stresses in Cofferdams and Similar Structures

Determined by Other Than the Rankine Formula

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FROM a lifetime of experience with and study and observation of the action of soils restrained by walls, sheeting, and tunnel lining, Mr. Meem here records a rational theory for determining the amount and the point of application of the lateral pressure of earth. At variance with the theory expressed by Rankine, this rational analysis may serve as an aid to a better understanding of a simple problem that has none the less proved baffling.

RANKINE'S theory of earth pressure is based on the assumption that the lateral pressure of earth is due to the tendency of earth to slide on a theoretical plane of repose and that lateral pressure is cumulative toward the base, the center of lateral pressure being at a point one-third of the height above the base, Fig. 1. Although engineers commonly make use of this theory in their calculations, they almost always question it.

A seemingly more rational and easily demonstrable theory is that the lateral pressure of earth develops as a result of its restraint from sliding by sheeted trenches,

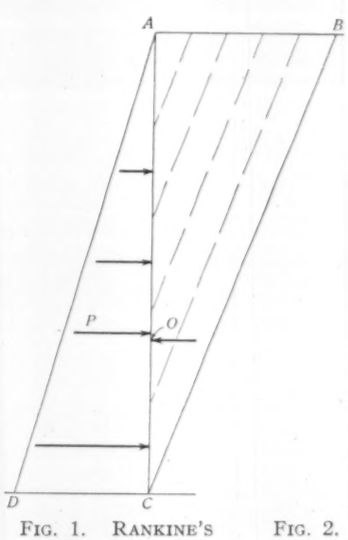


FIG. 1. RANKINE'S THEORY OF EARTH PRESSURE

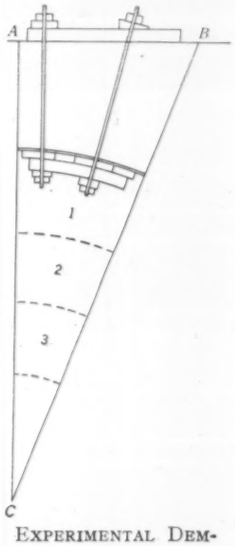


FIG. 2. EXPERIMENTAL DEMONSTRATION OF ACTION OF EARTH PRESSURE

retaining walls, or other structures. The tendency of earth to wedge or arch itself between such a structure and a theoretical plane of repose finds its center of pressure much higher than $h/3$, as given by Rankine.

A RATIONAL DEMONSTRATION OF EARTH PRESSURE

Using absolutely dry sand, it is not difficult to show with a small model, such as Fig. 2, that the volume between a wall on one side and the plane of repose on the other may be supported by ribs that are held in place by bolts connecting with top plates. The supporting, or lower, form should be covered with paper to form a contact without support at the edges, so as to prevent any wedging action by the form itself. Kiln-dried sand only should be used in making this experiment.

If instead of using a supporting form, it is assumed that support is given to each layer by the next lower layer, such as those marked 1, 2, and 3 in Fig. 2, it is seen that the thrust due to this lateral pressure is approximately determinable and that the maximum thrust is much higher than as found under the Rankine theory. It is also apparent that it is not cumulative to a maximum at the toe, as indicated in Fig. 1. This can be observed in any trench or tunnel operation where the soil is normally dry.

Referring again to Fig. 2, if it could be assumed that the granular mass in the wedge ABC were a solid, its thrust would be a maximum at the top. However, since the arching action of soil does not develop sufficiently to cause lateral pressure between the two faces until a sufficient depth has been reached, it must be assumed that the maximum point of thrust is somewhere between the zero thrust at the top and the zero thrust at the bottom.

The rational solution of this problem is found in Fig. 3. All the soil in the area ABC is undoubtedly supported by the face AC on one side, and the mean plane of repose BC, on the other. If it be arbitrarily assumed that one-half of this wedge causes pressure against the face AC, and that the other half rests on BC, then the three problems that must be determined are: (1) the mean plane of repose BC, or the angle ACB; (2) the rational position of the mid-plane MC; and (3) the elements and measure of thrust due to the area, or volume, AMC.

A large number of measurements and observations made on old mines, tunnels, and similar structures,

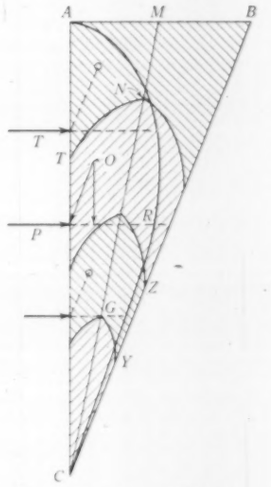


FIG. 3. ACTION OF EARTH PRESSURES BEHIND A WALL

FIG. 4. SHAPE AND LOCATION OF PLANE OF RUPTURE

including back-filled trenches and retaining walls, have determined that the relationship between the "break line" distance AB, in Fig. 4, and the height AC is normally 4 to 10. That means that, in all operations

except those in clean dry sand or minor ones in special cases, the distance AB may be assumed to be not more than 40 per cent of the height. Although it is true that, in many operations in compact hard soils, the pressure on the sheeted trench is not found to be nearly as great as that indicated by this relationship, it is also true

BLACK ROCK COFFERDAM BEFORE UNWATERING
A Cellular Sheet-Pile Structure, Piles Bulged by Pressure of Material

that the completely back-filled structure will have to sustain these pressures eventually.

For many years I have urged the making of experiments or tests, on a scale sufficiently large to be conclusive, to determine these values and have designed apparatus to do this. Until experimental data are obtained by means of such large-scale tests, the relation of the dividing line or plane MC to the mean angle of repose ACB can only be assumed.

Although it is not probable that the plane of repose, shown in Fig. 4, can be indicated by a straight line BC, but rather must be shown by a curved line BLC, a mean line or chord, Ba-C, may be assumed for purposes of calculation. The mean thrust of one-half the wedge, represented by the area $ATNM$ in Fig. 3, is probably not wholly horizontal but more probably acts downward and outward along a line parallel to BC at T, and the center of gravity of the mass is located at O. The maximum thrust is exerted at P, which is readily found to be at a point approximately 0.54 of the height AC.

In Fig. 3 it is also seen that the average mean thrust of the area ARC, at P, is measured approximately by one-half of AM, or one-fourth of AB—that is, $\frac{0.4\,AC}{4} = \frac{1}{10}\,AC$. Thus, for normally dry soil, the average pressure per vertical foot on the face of AC is $^1/_{10}\,AC$ times 100 lb, the weight of a cubic foot of earth. Thus, if AC equals 40 ft, the maximum pressure on it is 800 lb per sq ft at P, and its average is 400 lb per sq ft, reducing to a minimum of zero at A and C. The moment of this pressure per linear foot is $400 \times 40 \times 0.54\,AC = 16{,}000 \times 21.6$.

PRESSURE EXERTED BY WET FILL

This determination holds in all cases of subaqueous soils in their undisturbed natural beds, but does not of course apply to freshly deposited mud or to soils that have been liquefied by leaks or other disturbances. For purposes of safety, however, there should be added to the foregoing an increment of from 40 to 50 per cent of the normal co-related hydraulic pressures.

If in Fig. 5(*a*) the line AD is taken as the normal hydraulic pressure, AE is the hydraulic pressure co-related to the weight of earth, in the ratio $62^1/_2$:100 lb per cu ft. Then AF may be drawn to represent a reduction of pressure of 50 per cent allowance for voids in the soil. Assuming AHC in Fig. 5(*b*) to be the pressure curve due to normally dry soil, found as previously indicated, and AF to be 50 per cent of the related hydraulic pressure, as determined in Fig. 5(*a*), then ALD represents their sum, or the curve of combined pressure.

The combined lateral pressure of earth and soil is never in any instance in excess of the hydraulic pressure of water. To design a structure for lateral hydraulic pressure of soils due to a hydraulic head of from 120 to 130 lb per cu ft is erroneous. If the soil is under such agitation as to be fluid, its hydraulic head cannot be greater than that of water. It is true that, for a short time, small quantities of freshly deposited mud may exert hydraulic pressure greater than that of water, largely as a result of the shock of placing. However, this condition is not applicable to large volumes of "soupy soils," where the water alone and not the mud in it exerts the hydraulic pressure. This does not of course refer to absolute weight, but only to lateral pressure. One would be as justified in designing a structure by assuming less than hydraulic pressure if the water were filled with light hollow spheroids, because a cubic foot of this mixture might weigh less than $62^1/_2$ lb, as in designing such a structure for a hydraulic pressure in excess of $62^1/_2$ lb, because a cubic foot of the soil and water weighs more than $62^1/_2$ lb.

However, the principal reason for stating this to be a fact is that there is, to my knowledge, no instance on record in which hydraulic pressure greater than normal has been required in connection with compressed air work. In the soft clays under Detroit and the Detroit River; in the harder clays underlying East Boston Harbor; and in the silts under the Hudson River, there are many instances where tunnel work has been carried on against open faces under compressed air, at a gage pressure much under that corresponding to the hydraulic head. For instance, in the old Hudson River tunnel, built and partly completed by Haskins in 1883, the work was advanced against an open-face under approximately one-half the hydraulic head measured from river surface to tunnel heading. If pressure corresponding to a hydraulic head equivalent to 120 lb per sq in. had been used, the men could not possibly have worked in the 90 lb per sq in. of air pressure required to hold the face. In the East and other rivers, however, where the soil is sandy, the full hydraulic head has usually been required.

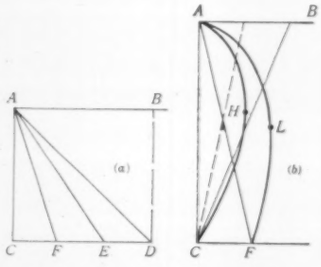


FIG. 5. DETERMINATION OF COMBINED PRESSURE OF DRY SOIL AND ENTRAINED WATER

APPLICATION TO DESIGN OF CELLULAR COFFERDAM

In the use of sheet-pile cofferdams, the problem of the bending moment in the piling itself becomes relatively simple after the other problems have been solved. It is largely a matter of the relation between the strength of the interlock and the resisting value of the embankment at the toe. The three major problems are: (1) to estimate the allowance for pressure due to the soft or liquid soil in the dam and the shock of dumping it; (2) to determine the internal pressure against the de-

watered face due to the compacted fill; and (3) to determine the value of the overturning moment, and the thickness of dam required to resist it.

In this article the diaphragm type of cellular cofferdam will be used as an illustration, and dimensions similar to those of the Black Rock cofferdam, shown in Fig. 6, will be assumed. These dimensions were 30-ft square cellular bays, a depth of 20 ft of water, and 20 ft of mud over the rock.

For pressure due to dumping in the soft mud, it may be assumed that the dumping can be so regulated as to be completed before unwatering is begun, and that if it is carefully done the stress in the interlocks will cause further bellying but no serious strain. As already explained, an average pressure of 400 lb per vertical foot and a maximum pressure of 800 lb per sq ft, acting at a point 24 ft above the bottom, may be assumed.

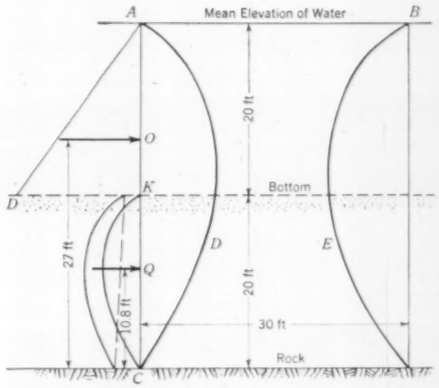


FIG. 6. STRESSES IN A SHEET-PILE COFFERDAM, CELLULAR TYPE

It may be assumed further that the internal stresses are balanced and that the only overturning stress of real importance results from the pressure of the water alone, although the combined pressure at Q (Fig. 6) must also be taken into account.

Let T equal the thickness of the cellular dam and P the pressure of the water alone, that is, between the bottom of the excavation and the top of the water outside the dam, or

$$62.5 \times \frac{20}{2} = 625 \text{ lb}$$

per ft, or 12,500 lb per lin ft

The center of this pressure is at a point 27 ft above the toe, and its bending moment for the water pressure alone is $12,500 \times 27 = 337,500$ ft-lb.

The added pressure at Q, found by the methods already noted, is approximately equal to $250 \times 20 = 5,000$ lb per vertical foot for the combined pressure at the soil depth CK, and as it acts at a point 0.54 above the bottom, the resulting bending moment is $5,000 = 10.8 = 54,000$ ft-lb.

The thickness required to balance the combined moment of 337,500 plus 54,000 ft-lb, or approximately 400,000 ft-lb, is

$100 \times 40 \times T \times {}^1/_2T$, or $2,000 \times T^2$. From this,

$$T = \sqrt{\frac{400,000}{2,000}} = 14+ \text{ ft}$$

It is thus seen that the Black Rock cofferdam carried a safety factor against overturning of a little over 2, even without the embankment left at the toe. In the case of this operation, as in other similar ones on a large scale, the embankment left at the toe was necessary to prevent sliding as well as to provide an extra safety factor for other stresses.

The points to be specifically stressed in the design and building of cofferdams are as follows: (1) to drive the sheet piling as plumb and true as possible in order to avoid abnormal stress, particularly in the interlock; (2) to drive the sheet piles for the cross-connections and for connecting the ties, where used, as nearly plumb as possible and in synchronization in order to fully develop the stress in the tie, or to avoid undue stresses; (3) to avoid, as far as possible, any poorly made closures or breaks in the piling likely to cause excessive leakage; and (4) to properly toe in the piling or leave proper protection at the toe.

In the Black Rock cofferdam, although there was no evidence of any strain due to tendency to overturn or slide, the piling bellied vertically as a result of insufficient modulus of resistance. This caused stresses at some points in the interlock far in excess of the maximum interlock stress of 2,500 lb per lin in., determined as already noted. If it had been possible to drive this piling in perfect alignment and with the maximum normal stress on the interlocks developed as well as that in the cross-connections, vertical bending might have been largely eliminated. However, it developed that this condition could not have been met in actual practice. The Black Rock cofferdam stands out as a fine example of work well executed under conditions in which theory, practice, and a fair allowance of safety factors were coordinated.

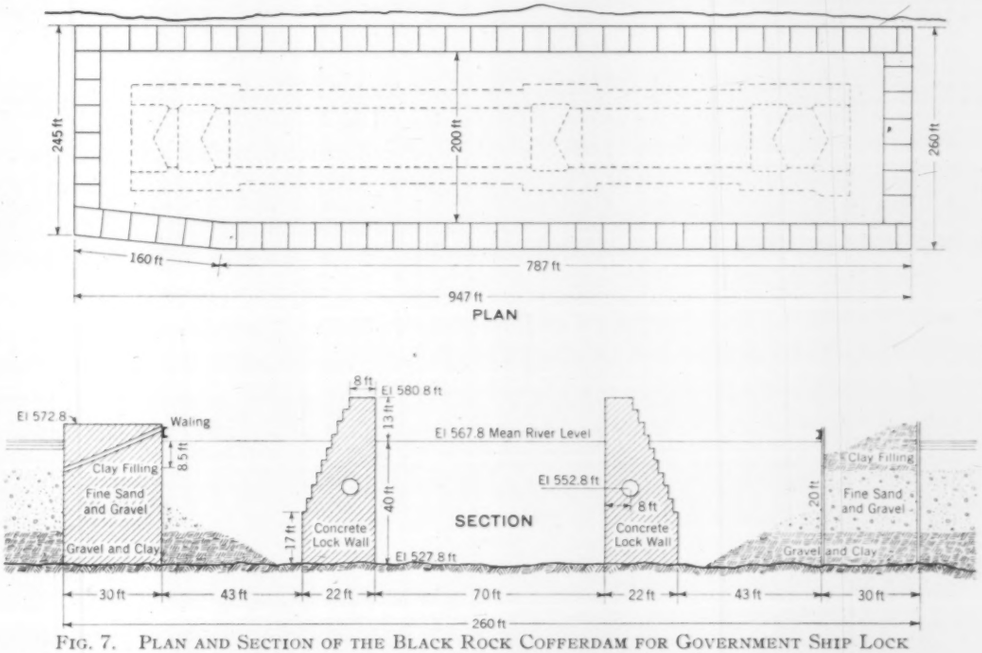


FIG. 7. PLAN AND SECTION OF THE BLACK ROCK COFFERDAM FOR GOVERNMENT SHIP LOCK
Built to Improve a Side Channel of the Niagara River in the Harbor of Buffalo in 1909

Grade-Crossing Elimination, Whitehall, N.Y.

Old Tunnel Removed and Tracks in Center of Village Relocated

By James M. MacMartin
Member American Society of Civil Engineers
Chief Engineer, the Delaware and Hudson Railroad, Albany, N.Y.

AT the head of Lake Champlain, lies Whitehall, N.Y., a village of 5,000 people. Crowded into the narrow valley in which this town is located, are the main tracks of the Delaware and Hudson Railroad, the New York State Barge Canal, and some arterial state highways. The railroad traversed two main streets of the village for a distance of about 3,000 ft and crossed at grade two other main highway routes, thereby obstructing and endangering traffic. A 75-year-old, single-track tunnel under the center of the town effectively blocked any improvement of the railroad's operating facilities. The story of how the difficult job of relocating tracks, removing the tunnel, eliminating all crossings at grade, and building overcrossings without interrupting the traffic on either highway or rail routes is told in this article. The project required two years and involved an expenditure of nearly a million and a half dollars.

IN advancing its grade-crossing elimination program under the State of New York Grade-Crossing Elimination Act, the Delaware and Hudson Railroad recently completed at Whitehall, N.Y., an elimination project involving several interesting methods of design and construction. The project is located about 77 miles north of Albany at the junction of the Saratoga

Removing Old Tunnel. Liner Plates Protect Traffic

and Champlain divisions and the Rutland Branch of the Delaware and Hudson Railroad system, a point of considerable railroad traffic. Whitehall is also on the main north and south state highway, which runs through the Hudson Valley and extends north along the west shore of Lake Champlain to the Canadian border. It is also the junction of a main highway to Vermont and the New England states. Both of these routes carry heavy traffic, especially in the summer time.

The village of Whitehall, with a population of about 5,000, lies in a narrow valley formed at the point where Wood Creek, which here becomes the New York State Barge Canal, enters Lake Champlain. On the east and west the village is hemmed in by steep mountains. This topography concentrates the rail, highway, and water routes within narrow limits and was the basic cause of the problems that were solved by the construction of the elimination project at Whitehall.

As shown in Fig. 1, the double-track main line of the Delaware and Hudson Railroad entered the village from the South, originally passing the station on the west. The double track ended at the station, and the single track ran north along the center of Main Street for a distance of 1,760 ft, with single lanes of highway traffic on each side. At Church Street, Main Street turned slightly to the east, and the main highway and village traffic passed over it. The railroad ran north through the center of Church Street, with traffic lanes on either side of the track for a distance of 500 ft. It then entered a tunnel extending 677 ft under the center of Church Street.

TUNNEL EIGHTY YEARS OLD REPLACED

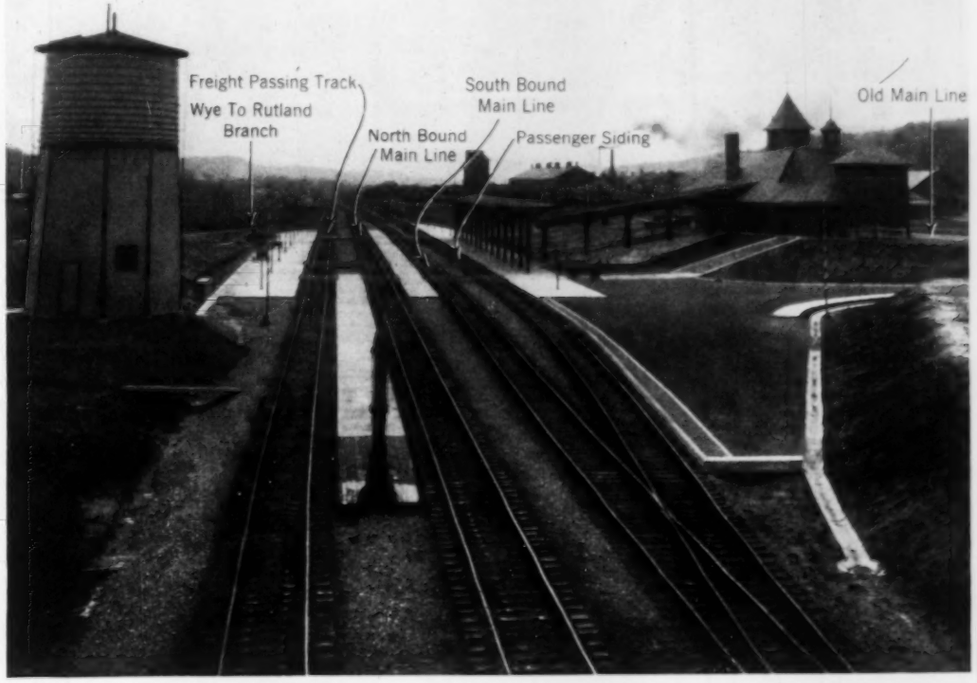
Constructed in 1850, when the Rensselaer and Saratoga Railroad was carried through Whitehall to provide a through rail connection between the Hudson Valley, the Lake Champlain region, and the Canadian border, the Whitehall Tunnel was one of the oldest on American railroads. Although there were some 40 tunnels already in existence at the time it was built, this tunnel was constructed originally by the open-cut method and then refilled, there being at the most not more than 50 ft of earth over the top of the arch at any point. The tunnel structure, 677 ft long, consisted of low bench walls of stone masonry on which was placed a 30-in. arch of brick masonry, Fig. 2(*a*), (*b*), and (*c*). The vertical and horizontal clearances were limited for modern equipment.

In 1873, an 80-ft section, starting 71 ft in from the south portal, was rebuilt. Due to the soft blue clay subsoil, it was necessary to construct a heavy timber mat to carry the masonry and track structure, Fig. 2 (*b*). The structure was greatly strengthened by heavy stone masonry sidewalls topped by a semicircular brick arch $2^1/_2$ ft thick. In 1885, the clearances were somewhat increased by replacing a portion of the old brick arch with heavier masonry in a section 93 ft long, ending 75 ft from the north portal. A year later, the 71-ft section, beginning at the south portal, was rebuilt with stone masonry sidewalls and semicircular brick arch roof. During each of these major changes the floor of the tunnel was dropped to provide greater vertical clearance. In addition, because of the great age of the structure, it was necessary from time to time to make many small repairs on the brick arch lining.

About 174 ft north of the north portal of the tunnel, the railroad crossed Bellamy Street at grade. This street was also on the main state highway route. The

railroad extended north of Bellamy Street on a fill for about 2,360 ft over a swamp and the backwater of Lake Champlain. There were several streets intersecting Main Street south of the tunnel and three crossing Church Street over the tunnel. Boardman Street intersected Main Street north of the railroad station and carried main route highway traffic east to Vermont and New England.

Since Main Street was occupied by the railroad and the intersections of the other streets carrying both main highway and local traffic, it was determined by the Public Service Commission, under authority delegated by the Grade-Crossing Act, that public safety required the elimination of the crossings at grade. On August 20, 1930, an order was passed by the Public Service Commission, directing the Delaware and Hudson Railroad to proceed with the necessary work to effect the elimination of the grade crossings. This project involved extensive track relocation, as shown in Fig. 1.



LOCATION OF NEW TRACKS IN GRADE-CROSSING ELIMINATION PROGRAM

Track relocation was begun 4,350 ft south of the station, this point being determined by the location of a turnout for a track to the existing railroad roundhouse, shops, and yard tracks lying south and west of the station. These facilities were retained, the proper connections being made to them and necessary crossovers incorporated in the relocated and existing mains to the south. From this point to the station to the north, the tracks were relocated east of, and at a lower elevation than, the original tracks, until at the station the center line between the main tracks was about 130 ft east of the station and about 10 ft below the elevation of the existing tracks, with the new profile on a minus 0.3 per cent compensated grade northbound. At the beginning of the project a running track for freight service, parallel to and east of the two main tracks, was extended to a point 1,775 ft north of the station to provide for detouring freight trains around passenger trains standing in the station. A side track was provided at the station west of the southbound main line for handling passenger trains. There was also provided a wye connection for the Rutland Branch, opposite the passenger station, with turnouts from the freight passing track. This connecting wye was restricted in length by an existing bridge over the Barge Canal carrying the branch line.

During the process of track relocation, the existing station was retained. With the addition of a passenger ramp from the station to concrete platforms serving the four tracks, an express and baggage elevator within the station, macadam driveways, and other minor changes, the station provided suitable facilities for handling the passenger service.

Existing Boardman Street, which was intersected 520 ft north of the station by the relocated tracks, was closed on the west side of these tracks. A new street was provided on an overcrossing 125 ft south of the existing street with a 40-ft roadway and a sidewalk on the north side of the bridge. On the west of the track it connects to Main Street with an approach on a fill carrying a concrete pavement, curbs, and sidewalk on

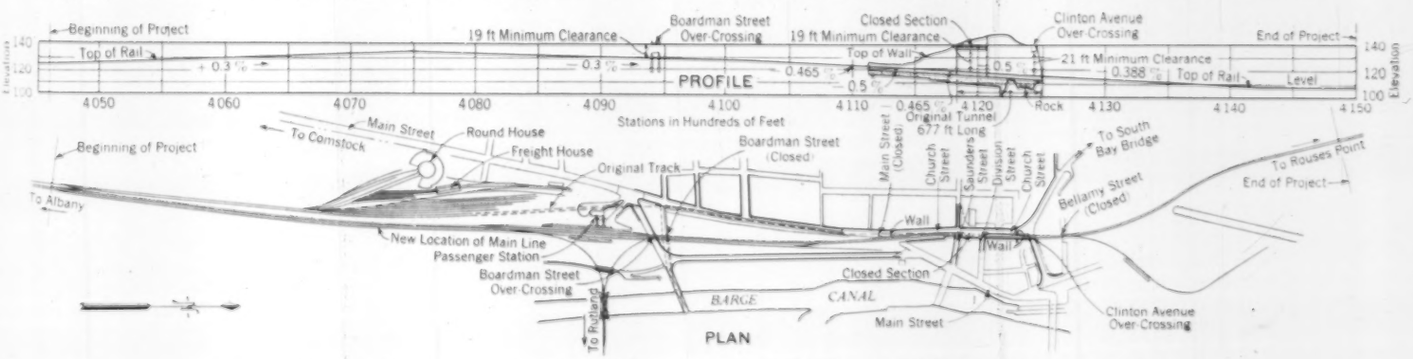


FIG. 1. TRACK RELOCATION AND GRADE-CROSSING ELIMINATION, WHITEHALL, N.Y.

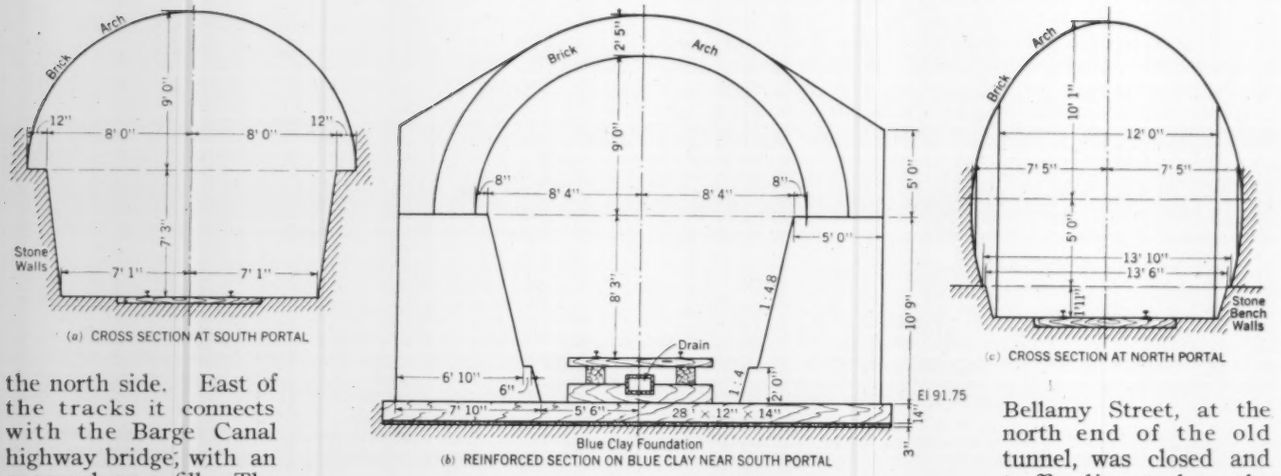


FIG. 2. SECTIONS OF OLD TUNNEL REMOVED

the north side. East of the tracks it connects with the Barge Canal highway bridge, with an approach on a fill. The Barge Canal Bridge was rebuilt by the New York State Department of Public Works, Division of Highways, to conform to the grade of this approach. The overcrossing was built with structural steel girders, floor beams, and stringers supporting a reinforced concrete deck, on which was placed a 4-in. reinforced concrete wearing surface. The girders are supported by structural steel units, bearing on concrete piers with foundation piles of timber. From the north side of the east approach, a new street 2,000 ft long was constructed, parallel to the relocated tracks, and extended to a connection with Main Street in the business section of the village. This connection provides a new 30-ft street paved with 8-in., New York State standard, reinforced concrete. There are sidewalks on both sides of the street.

North of Boardman Street the tracks were relocated to the east of Main Street, to which they are generally parallel. Passing along the rear of the business blocks and residences on Main Street, they occupy a portion of the old abandoned Champlain Canal bed. The alignment of the relocated tracks crosses Main Street and enters Church Street with the center line between the two tracks 5 ft to the east of the center line of the original track, which was also the center line of the old tunnel.

On the east side of the tracks Main Street was closed at grade by means of a concrete balustrade across the street. On the west side a heavy concrete retaining wall was constructed, extending from the intersection of Church and Main streets to the south side of Saunders Street. A rectangular closed section 241 ft long, with a clear width of 29 ft and clearance above top of rail of 19 ft, was carried from the south side of Saunders Street to the north side of Division Street. From this point north, an open cut was carried with a low retaining wall on the east and a heavy concrete wall on the west. The heavy concrete wall on the west supported a new 36-ft concrete pavement along Church Street and provided a direct route for main highway traffic from Main Street to the north. The closed section supported a paved plaza area to the east of relocated Church Street and carried Saunders and Division streets to connections with Church Street. Clinton Avenue, a new overcrossing, was carried across the tracks 375 ft north of the closed section by a girder bridge, High Street and the former Clinton Avenue being closed on both sides of the new tracks.

Bellamy Street, at the north end of the old tunnel, was closed and traffic diverted to the new Clinton Avenue and Church Street. Since the grade of the railroad at Bellamy Street was some 5 ft higher than the existing top of rail, the railroad was carried across the swamp on a minus 0.5 per cent compensated grade for a distance of 1,580 ft to an intersection with the existing grade. The fill across the swamp was widened on the east to accommodate the second track, and both main tracks were raised to the level of the new grade.

TRAFFIC MAINTAINED DURING CONSTRUCTION

In the design of the Church Street structures, a careful study was made of the construction methods to be employed in the completion of this part of the project. As shown in Fig. 3, the new closed section was designed with its center line 5 ft east of the old tunnel center line, and the profile of the relocated tracks through Church Street was fixed to permit of the maintenance of rail traffic on the existing track, until it could be transferred to the new construction.

The concrete retaining wall of the west side, north of the closed section, was designed with a section having a base of 0.55 of its height supporting the new Church Street at a maximum height of 34 ft above the subgrade of the tracks. This wall has a maximum height of 50 ft above its foundation and extends to a point north of the new Clinton Avenue overcrossing.

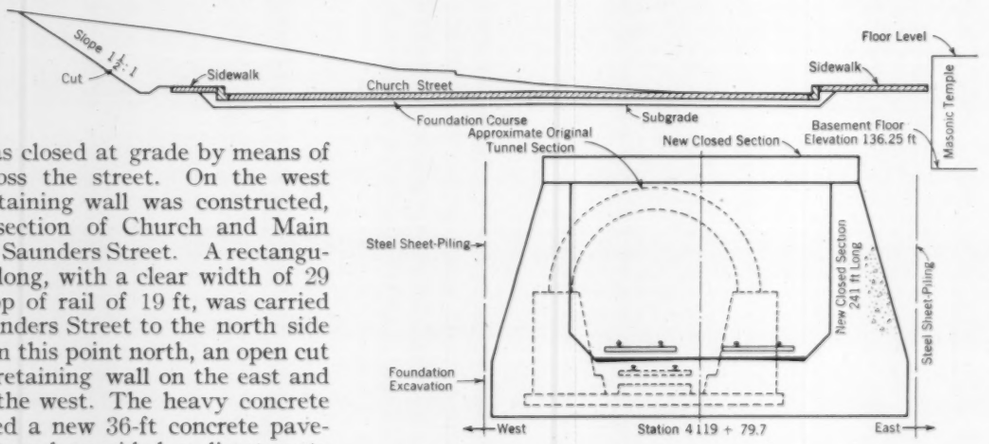


FIG. 3. RELATION OF OLD TUNNEL TO NEW CLOSED SECTION

On the east side, north of the closed section, a low

wall with foundation to rock was constructed with the twofold purpose of sealing in a vein of quicksand encountered near the track subgrade and also of forming a berm for the heavy open clay cut on this side. South of the closed section, along the west side of the tracks, a gravity concrete wall was carried south to the intersection of Main and Church streets. This wall supports the new Church Street, Fig. 4. Foundations for it consist of timber piles driven to rock. At the south end of the wall, where the rock dipped too deep and the height of the wall had decreased, the piles formed the support.

As shown in Fig. 5, the new closed section, 241 ft long, was designed with a horizontal clearance of 29 ft and a vertical clearance of 19 ft. The base of this structure is a reinforced concrete slab, 6 ft thick, supported on timber piles driven to bedrock. The standard ballast track section rests directly on the base slab, which supports heavy reinforced concrete sidewalls. These in turn support the 24.4-in. 140-lb structural steel beams forming the top. The beams are 34 ft long, have a center-to-center spacing of 25 in., and are entirely encased in concrete. This cross section was designed to permit of pouring in five separate stages.

LOOKING SOUTH FROM END OF CLOSED SECTION
Church Street on the Right

METHOD OF REMOVING TUNNEL

The construction along Church Street and the task of removing the old tunnel were complicated by the necessity of maintaining the heavy passenger and freight train service without interruption. In removing the tunnel, a cut was made by steam shovel over the top of the arch. Two rows of heavy steel sheet piling were then driven, one on each side of the arch, just outside the outline of the new tunnel and retaining walls. During this operation care was taken to leave sufficient room for construction operations. Excavation was continued down to the top of the tunnel arch. Then the tops of the two rows of sheet piling were braced apart by means of heavy horizontal timber struts, placed on 10-ft centers. These horizontal struts were alternated with inclined bracing, placed on as steep a pitch as would provide clearance for trains.

The dismantling of the old tunnel was carried forward, the brick-arch ring first being removed by means of jackhammers. During this operation, rail traffic was protected by steel-liner plates specially designed to reduce the already close clearance by only about 2 in. These liner plates were bolted together to form a rigid continuous lining, which was supported on the sidewalls of the old tunnel. The shield, which was 50 ft long, was extended during the process of removing the arch by taking down the plates from behind and setting them up ahead. Diagonal timber braces were set up between the horizontal braces as the brick arch was removed. Due to unstable ground conditions at the south end of the tunnel, where wet blue clay was encountered, specially built-up struts, provided with lateral bracing, were placed between the steel sheet walls.

After the removal of the brick arch and the haunches, the track was thrown as far toward the west wall as the maintenance of lateral clearance would permit. A row of short, steel sheet piles was then driven along the center line of the new closed section with its top approximately at the level of the old tunnel floor. After this the old east wall was removed, and the piling through the center of the closed section was braced to the east row of sheet piling by means of heavy, horizontal, timber braces. The east wall for the new subway; the low, east, retaining wall north of the closed section; and the east half of the subway invert were then constructed in 10-ft sections. As each section was excavated the walls were put in. Also, the open-cut north of the closed section and east of the low retaining wall was made at this time.

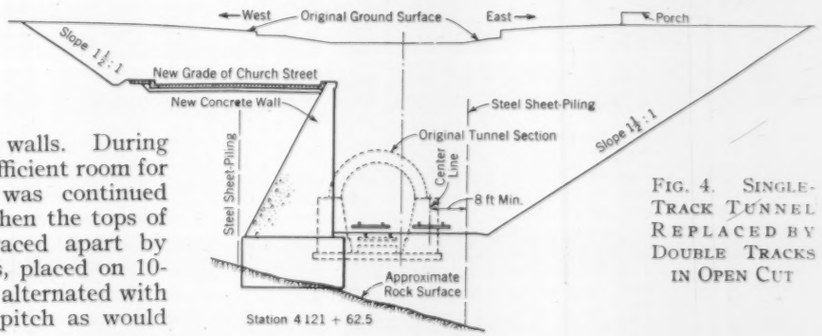
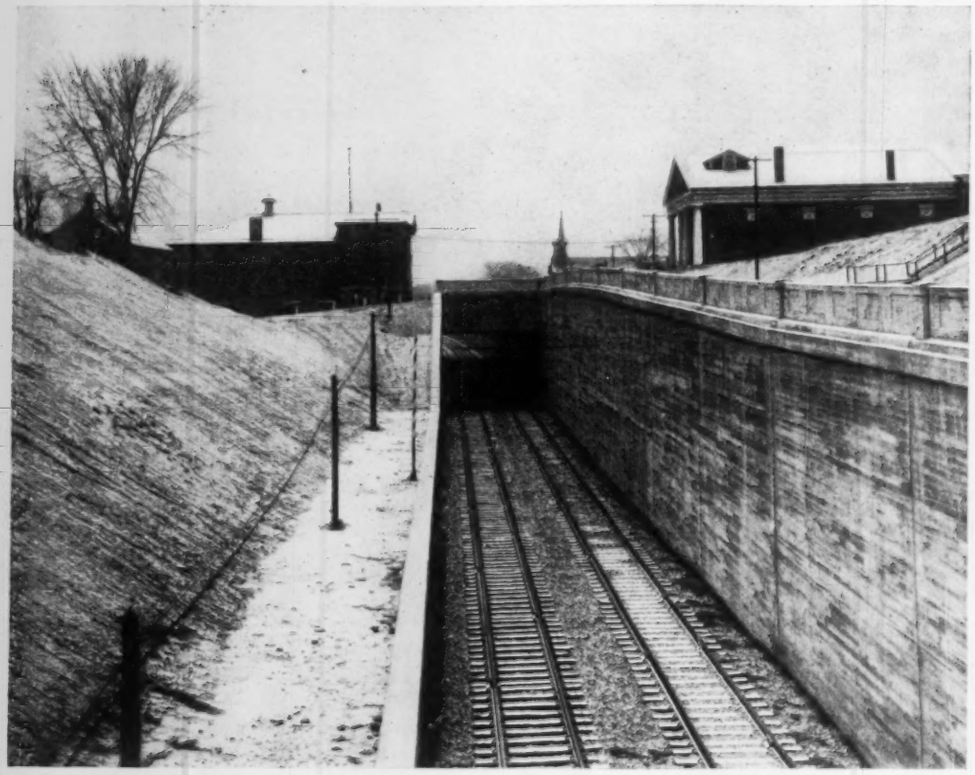


FIG. 4. SINGLE-TRACK TUNNEL REPLACED BY DOUBLE TRACKS IN OPEN CUT

Upon completion of the east walls and east half of the subway invert, the track was thrown to the east and a similar procedure was employed on the west side. Then the subway roof was constructed and backfilled to the subgrade of the plaza over the closed section; the

pavement was placed; Saunders and Division streets were carried across the subway to new Church Street; and the second main track was laid. Concrete balustrades were carried on the top of the west walls supporting Church Street and on the portals of the closed section.

The backs of all concrete structures were treated with emulsified asphalt, and the deck of the closed section was waterproofed with a 3-layer fabric encased in asphalt, which in turn was protected by a $1^1/_4$-in. asphalt plank course. Sheet copper was used at all construction joints as a water seal.



LOOKING SOUTH FROM THE CLINTON STREET OVERCROSSING
Showing Closed Section, Saunders and Division Streets. Old Single-Track Tunnel Replaced by Open Cut

In order to provide right-of-way for the relocated railroad and highways and to clear the site for construction, it was necessary for the State of New York to appropriate 165 parcels of land, including lands in fee and easement rights for slopes, drainage, and the moving or razing of buildings. On this land were located approximately 70 major structures, including dwelling houses, business buildings, and garages, which it was necessary to move or raze either before or during construction.

Due to the fact that the general level of the relocated tracks south of the closed section was below the existing ground surface, it was necessary to devise a method of railroad drainage. This was accomplished by a system of open and closed drainage south of the closed section, flowing to the south against the new grade of the railroad and having its outlet in the Barge Canal. Surface and highway drainage was carried into the rebuilt village system. A new drainage system was also provided at the station grounds. North of Bellamy Street on the main-line tracks, a deck-girder culvert over the backwater of Lake Champlain was replaced by a double, reinforced-concrete, pipe culvert, 2 ft 6 in. in diameter, supported by a timber cradle on a timber pile foundation.

It was necessary to remove, relocate, and rebuild village sewers and water lines when they were encountered in this construction work. Pole and wire lines, conduits, and other public utilities were also relocated, where necessary, in the course of construction.

Some of the major items of expenditure required on the contract portion of the project were as follows: 166,500 cu yd of excavation; 48,500 bbl of portland cement; 27,000 cu yd of concrete in structures and pavement; 285 tons of reinforcing steel; 715 tons of structural steel; 1,440 tons of steel sheet piles; and 71,000 lin ft of wooden piling.

Track and signal work on the project was done by the railroad maintenance-of-way department. The work in charge of the railroad, such as temporary track and signal shifts in various stages of the project, was coordinated to the progress of the contractor.

The total cost of the project, including contract work, account work of the railroad forces, and land and property damages, was approximately $1,400,000. The contract was let on December 9, 1931, to the Hecker-Moon Company, of Cleveland, Ohio, and the contractor's work was completed on January 3, 1934. Plans for the project were prepared and construction was supervised by the chief engineer of the railroad corporation.

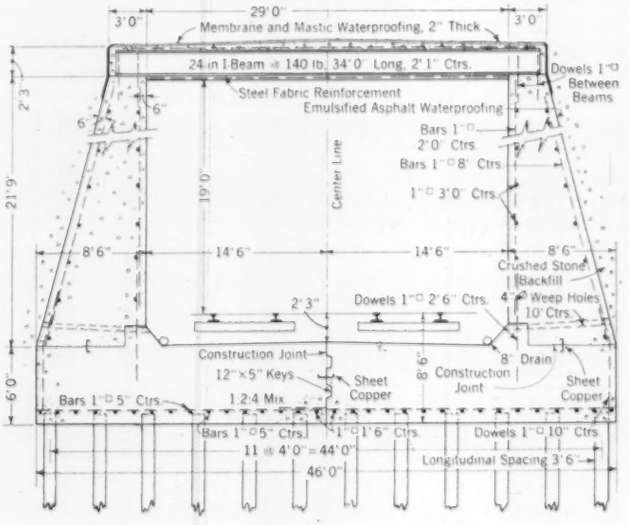


FIG. 5. DETAIL OF CLOSED SECTION

Durability of Hoisting Rope

A Discussion of Length of Life to Be Expected and Factor of Safety

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IN hoisting rope a factor of safety, based on breaking strength, has an entirely different meaning from that factor as used in the design of static structures. In addition to the provision for unknown stresses due to bending in passing over sheaves, such factors as dynamic stresses during starting and stopping, frictional resistances at sheaves, and loss in strength with use and age must be taken into account.

Loss in strength in moving cables and ropes results from any one or all of the following causes: (1) corrosion due to moisture and special acid conditions of the air; (2) worn wires, that is, the frictional reduction of wire areas caused by individual wires rubbing against each other at any change in relative position; (3) kinked wires, due to improper use of the rope or sudden impact at starting or stopping; (4) abrasion caused by continual or intermittent contact with fixed objects as well as sheaves; (5) cutting of wires, especially at misfit sheave grooves; (6) fatigue of wires in bending over sheaves, especially if sheaves are too small, which causes rapid change of shape and internal stresses; and (7) crushing due to improper drum design, resulting in a squeezing of the core and change of form of cable from the circular shape.

Each factor is important, because any variation in the size of individual wire or in minimum diameter, when the shape changes from the original circle, causes a marked increase in calculated and actual stress from static loading. For instance, crushing the hemp center will cause a misfit at the sheave, increased bending stress, and unusual and serious wear of the wires in contact at the sheave groove. It can also result in sudden failure without any apparent cause or warning. Almost without exception, failure in such a case does not occur when the cable is at the point where the damage was done.

Much has been written concerning the proper care and maintenance of wire ropes, but little has been published concerning their expected life. Users of wire rope have most inconsistent records. Yet the process of manufacture is perfected to such a point that a faulty rope is a most unusual occurrence. For example, by using a separate spool for each wire in a strand, the chance that bad wires from a bad spool will meet a section of a rope is eliminated.

Theoretically, the life of a rope ends just before failure, but actually a safer definition must be used. The U. S. Master Specifications for Wire Rope (U. S. Bureau of Standards, Circular No. 208, issued 1925) advises as follows:

> No definite rules can be given which will enable an inexperienced person to decide when a worn rope should be replaced by a new one. However, the following suggestions will, it is believed, be of assistance.
>
> The service for which the rope is used and the damage which might result, if the rope broke, are of great importance. Consider the three conditions which follow:
>
> 1. If little or no damage would result from the rope's breaking, a wire rope might, theoretically, be used until it fails. Practically, however, this is undesirable under any circumstances.
> 2. If material is hoisted, the rope should be renewed before there is a reasonable probability that it will fail.
> 3. If persons are hoisted, as in a passenger elevator, every reasonable precaution should be taken that will prevent failure of the rope in service. A rule which has been used is to replace a rope if it shows more than six broken wires per foot or has three or more adjacent broken wires in the same strand.
>
> For the first and second conditions, the rope may be used, if there are no broken wires, until the thickness of the outside wires is about one-third of the original diameter. If many of the wires are broken, even if the rope is not worn, it should be replaced by a new one. Wire ropes should, under any circumstances, be replaced, if there are as many as ten broken wires in any one foot of the rope.

For a fixed set of conditions, the life of a rope can be increased by turning the rope after a limited use, so as to distribute the wear on the exterior wires. However, as was pointed out by F. C. Carstarphen, M. Am. Soc. C.E., in Vol. 92 of the TRANSACTIONS of the Society, page 894 (1928), "It will not do to operate cable for a long time in one position and thereby allow the wires to assume a permanent set, due to the development of large internal adhesive forces, and then turn it, for the cable will then show broken wires, very quickly."

In general, increasing the speed of a cable decreases its life. However, there are no data available to demonstrate the variation of life with regard to speed of operation, so that it is impossible to compute the economical relation between speed and size of cable for any given load condition.

For mine work, the minimum factor of safety at any one time, based on actual inspection and measurement of a rope, is fixed by a number of state regulations. The recommendations of the U. S. Bureau of Mines are as shown in Table I.

TABLE I. RECOMMENDED FACTORS OF SAFETY FOR WIRE ROPE USED IN MINES

LENGTH OF CABLE IN FEET	MINIMUM SAFETY FACTOR FOR NEW ROPE	MINIMUM SAFETY FACTOR WHEN ROPE MUST BE DISCARDED	PERCENTAGE OF REDUCTION
500 or less	8	6.4	20
500 to 1,000	7	5.8	17
1,000 to 2,000	6	5.0	16½
2,000 to 3,000	5	4.3	14
3,000 and over	4	3.6	10

Accepting the rule that a rope is to be replaced when it shows more than six wires per foot, the tests reported by the American Cable Company and published in *Engineering News-Record* for February 25, 1932, page 287, can be used as a basis for estimating the endurance of a wire rope under service, as far as wear on sheaves and fatigue under bending stresses are concerned. In Table II are shown the number of revolutions required to produce 25 broken wires in a 4-ft length of rope for a load of 2,000 lb on the rope, which passed over three 12-in. sheaves, each revolution giving 4 or 6 bends in the rope, as noted.

In the article in *Engineering News-Record* previously referred to there is given a detailed discussion of the relative merits of various rope constructions.

For comparison with tests already mentioned, where ropes were properly lubricated and free from exterior corrosion or abrasion, an actual record of a $^5/_8$-in., 6 × 19 traction steel, non-preformed hoisting cable showed somewhat over 52,000 bends over a 12-in. sheave under a load of 1,000 lb, before actual failure of the rope occurred. This load, plus bending, friction, and acceleration, created a maximum effective load of 2,500 lb. Little if any attention was paid to lubrication or other precautions against short life.

TABLE II. REVOLUTIONS REQUIRED TO PRODUCE 25 BROKEN WIRES IN 4 FT OF ROPE

TYPE OF ROPE	NUMBER OF REVOLUTIONS	NUMBER OF BENDS PER REVOLUTION
$^5/_8$-in., 6 × 19 improved plow steel, preformed, regular lay	16,500	4
$^5/_8$-in., 6 × 19 improved plow steel, preformed, lang lay	24,000	4
$^1/_2$-in., 6 × 19 improved plow steel, filler wire construction, non-preformed	10,500	6
$^5/_8$-in., 6 × 19 improved plow steel, filler wire construction, preformed	16,000	6
$^5/_8$-in., 6 × 37 improved plow steel, flexible crane rope, non-preformed spacer Seale	16,000	4
$^5/_8$-in., 6 × 37 improved plow steel, flexible crane rope, preformed Seale	21,500	4
$^5/_8$-in., 6 × 19 traction steel, Seale elevator rope, non-preformed	9,000	6
$^5/_8$-in., 6 × 19 traction steel, Seale elevator rope, preformed	16,000	6
$^5/_8$-in., 6 × 27 traction steel, Seale elevator rope, non-preformed	12,000	6
$^5/_8$-in., 6 × 27 traction steel, Seale elevator rope, preformed	21,500	6

In Vols. 97 and 98 of the TRANSACTIONS of the Society, page 574 (1933), Mr. Carstarphen lists the service records of $^5/_8$-in., 6 × 19 ropes, regular lay, with a tension of 1,250 lb, running over 34-in. sheaves at a velocity of 550 ft per min. Table III has been prepared from that list.

TABLE III. SERVICE RECORDS OF WIRE ROPES $^5/_8$ IN. IN DIAMETER

MATERIAL	MANUFACTURER	NUMBER OF ROPES	MILES TRAVELED		
			Average	Minimum	Maximum
Iron	B	9	14,576	3,508	26,130
Swedish iron	C	2	15,910	7,168	24,653
Steel	A	1	10,247	...	....
Special steel	A	1	18,343	...	....
Special steel	B	1	5,732	...	....
Mild steel	A	11	19,565	5,723	48,091
Mild steel	B	4	9,522	4,714	13,678
Mild steel	C	1	5,925	...	....
Mild steel	D	2	10,110	2,625	35,565

Still another factor must be taken into account in considering variations in the life of a rope, namely, the manufacturer. In discussing Mr. Carstarphen's paper, C. D. Meals, M. Am. Soc. C.E., gives several results of tests on wire ropes of various types passed over sheaves. He reports the number of bends at the appearance of one broken wire and of 40 broken wires per foot. The appearance of one broken wire is not serious, but when 40 wires are broken in one foot of rope, the rope has exceeded its proper life. These tests seem to be in general accord with the report of the American Cable Company.

From the data given in this article it must be concluded that no reliable estimate can be made of the expected life of a hoisting rope until further tests are reported or records of many rope users are collected and analyzed.

ENGINEERS' NOTEBOOK

From everyday experience engineers gather a store of knowledge on which they depend for growth as individuals and as a profession. This department, designed to contain practical or ingenious suggestions from engineers both young and old, should prove helpful in the solution of many troublesome problems.

Fixed-End Moment Coefficients for Beams of Uniform Cross Section

By L. K. OESTERLING

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IN the Cross moment distribution method, the fixed-end moments play an important part. The accompanying tables have proved useful in quickly determining the fixed-end moments due to loads placed on a beam of uniform cross section.

Given a beam of uniform cross section of length, L, with fixed ends, and loaded with a concentrated load, P, at a distance, xL, from the left end, and $(1 - x)L$ from the right end, as shown in Fig. 1. The fixed-end moments at the left and right end of the beam are respectively:

$$FM_L = -(x - 2x^2 + x^3)\ PL = -APL \quad \ldots\ldots [1]$$

and

$$FM_R = -(x^2 - x^3)\ PL = -BPL \quad \ldots\ldots [2]$$

In Table I are given the values of the coefficients A and B for all values of x from zero to 1.0, varying by increments of 0.01. Table I can also be used when one end is free. The coefficient for the fixed end will be the value as taken from the table for that end, plus one-half the value as shown for the free end. That is, if the left end is fixed, and the right end simply supported, $A' = A + {}^1/_2 B$; and if the right end is fixed and the left end simply supported, $B' = B + {}^1/_2 A$.

For uniform loads on the span, as in Fig. 2, the moments at the left and right ends of the beam, when loaded with a uniform load, w, for a distance xL, from the left end are respectively:

$$FM_L = -\left(\frac{x^2}{2} - \frac{2x^3}{3} + \frac{x^4}{4}\right) \quad wL^2 = -CwL^2 \quad \ldots\ldots [3]$$

and

$$FM_R = -\left(\frac{x^3}{3} - \frac{x^4}{4}\right) \quad wL^2 = -DwL^2 \quad \ldots\ldots [4]$$

Table I gives the value of the coefficient C for all values of x between zero and 1.0, varying by the same increments as Table I. By the principle of superposition,

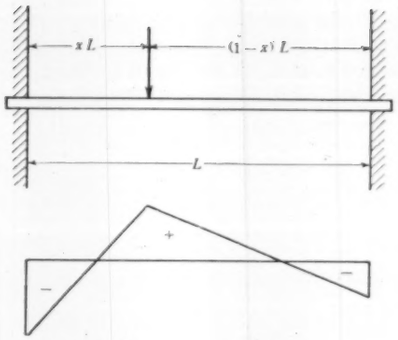

FIG. 1. MOMENT DIAGRAM FOR CONCENTRATED LOAD ON BEAM WITH FIXED ENDS

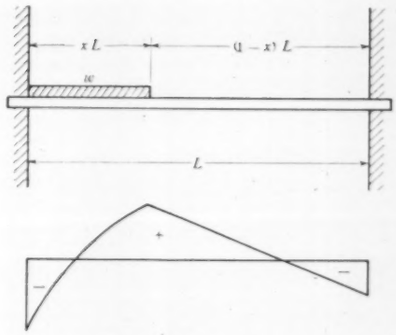

FIG. 2. MOMENT DIAGRAM FOR UNIFORM LOAD ON PART OF SPAN ADJACENT TO LEFT END OF BEAM WITH FIXED ENDS

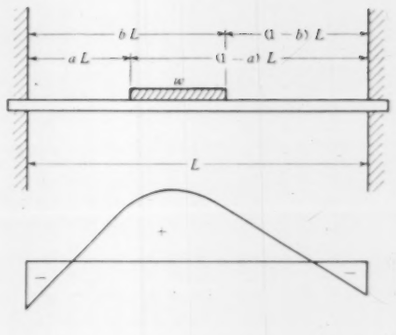

FIG. 3. MOMENT DIAGRAM FOR UNIFORM LOAD ON ANY PART OF BEAM WITH FIXED ENDS

the value of the coefficient C'' for a partial load between any two values of x, will be the difference between the tabular values corresponding to the values of x, or, if the beam is loaded between $x = a$, and $x = b$, as in Fig. 3,

$$C'' = C_b - C_a \quad [5]$$

A third table could have been given for the value of the coefficient D, but D can be obtained very easily from Table II by the following equation:

$$D = 0.0833333 - C_{(1.000 - x)} \quad [6]$$

For a beam loaded uniformly between $x = a$, and $x = b$, the coefficient for the right end is

$$D'' = C_{(1.000 - a)} - C_{(1.000 - b)} \quad [7]$$

Equations 6 and 7 express the fact that the coefficients for the right end of the beam are identical with the values of C and C'' obtained by the use of Table II, provided the values of $(1.000 - x)$, $(1.000 - a)$, and $(1.000 - b)$ are used, respectively, instead of the values x, a, and b.

The following examples may help to clarify the method. First, assume a concentrated load at point X located 0.33 of the span from the left end (Fig. 1).

Then $FM_L = -APL = -0.148137\ PL$

and $FM_R = -BPL = -0.072963\ PL$

Again, assume a uniform load extending from the left end of the beam to X located at 0.53 of the span from the end (Fig. 2).

Then $FM_L = -CwL^2 = -0.0609249\ wL^2$

and $FM_R = -DwL^2 = -(0.0833333 - 0.0534339)$
$= -0.0298994\ wL^2$

As the third example, assume that a uniform load extends between points located at 0.47 and 0.65 of the span from its left end (Fig. 3).

Then
$FM_L = -C''wL^2 = -(0.0727932 - 0.0534339)\ wL^2$
$= -0.0193593\ wL^2$

and
$FM_R = -D''wL^2 = -(0.0609249 - 0.0364182)\ wL^2$
$= -0.0245067\ wL^2$

If the left end is free, $FM_R = -[0.0245067 + {}^1/_2(0.0193593)]\ wL^2 = -0.043866\ wL^2$.

TABLE I. FIXED-END MOMENT COEFFICIENTS FOR USE WITH CONCENTRATED LOADS

$A = X - 2X^2 + X^3$ (Read Down)

X	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09		
		0.009801	0.019208	0.028227	0.036864	0.045125	0.053016	0.060543	0.067712	0.074529	0.081000	0.9
0.1	0.081000	0.087131	0.092928	0.098397	0.103544	0.108375	0.112896	0.117113	0.121032	0.124659	0.128000	0.8
0.2	0.128000	0.131061	0.133848	0.136367	0.138624	0.140625	0.142376	0.143883	0.145152	0.146189	0.147000	0.7
0.3	0.147000	0.147591	0.147968	0.148137	0.148104	0.147875	0.147456	0.146853	0.146072	0.145119	0.144000	0.6
0.4	0.144000	0.142721	0.141288	0.139707	0.137984	0.136125	0.134136	0.132023	0.129792	0.127449	0.125000	0.5
0.5	0.125000	0.122451	0.119808	0.117077	0.114264	0.111375	0.108416	0.105393	0.102312	0.099179	0.096000	0.4
0.6	0.096000	0.092781	0.089528	0.086247	0.082944	0.079625	0.076296	0.072963	0.069632	0.066309	0.063000	0.3
0.7	0.063000	0.059711	0.056448	0.053217	0.050024	0.046875	0.043776	0.040773	0.037752	0.034839	0.032000	0.2
0.8	0.032000	0.029241	0.026568	0.023987	0.021504	0.019125	0.016856	0.014703	0.012672	0.010769	0.009000	0.1
0.9	0.009000	0.007371	0.005888	0.004557	0.003384	0.002375	0.001536	0.000873	0.000392	0.000099		
		0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.02	0.01	0.00	X

$B = X^2 - X^3$ (Read Up)

TABLE II. FIXED MOMENT COEFFICIENTS FOR USE WITH UNIFORM LOADS

$C = {}^1/_2 x^2 - {}^2/_3 x^3 + {}^1/_4 x^4$

x	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
	0.0000000	0.0000493	0.0001947	0.0004322	0.0007580	0.0011682	0.0016592	0.0022273	0.0028689	0.0035804
0.1	0.0043583	0.0051993	0.0060998	0.0070567	0.0080667	0.0091266	0.0102332	0.0113835	0.0125744	0.0138031
0.2	0.0150667	0.0163622	0.0176870	0.0190383	0.0204134	0.0218099	0.0232251	0.0246566	0.0261019	0.0275589
0.3	0.0290250	0.0304980	0.0319761	0.0334568	0.0349381	0.0364182	0.0378950	0.0393667	0.0408315	0.0422876
0.4	0.0437333	0.0451671	0.0465872	0.0479923	0.0493809	0.0507516	0.0521029	0.0534339	0.0547430	0.0560293
0.5	0.0572917	0.0585290	0.0597403	0.0609249	0.0620816	0.0632099	0.0643089	0.0653780	0.0664165	0.0674241
0.6	0.0684000	0.0693439	0.0702555	0.0711344	0.0719804	0.0727932	0.0735728	0.0743191	0.0750321	0.0757118
0.7	0.0763583	0.0769719	0.0775526	0.0781009	0.0786171	0.0791016	0.0795548	0.0799773	0.0803696	0.0807323
0.8	0.0810667	0.0813728	0.0816518	0.0819045	0.0821318	0.0823349	0.0825147	0.0826724	0.0828091	0.0829263
0.9	0.0830250	0.0831067	0.0831729	0.0832250	0.0832646	0.0832932	0.0833126	0.0833245	0.0833307	0.0833330
1.0	0.0833333									

Azimuth and Hour-Angle Formulas Solved Graphically

By L. L. HUGHES, JUN. AM. SOC. C.E.
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ENGINEERS and mathematicians have devised many methods for the graphical representation of variable functions. Of the various methods utilized, one of the most valuable and probably the least common is that known as the "parallel coordinate system," which has also borne the names of "nomograph" and "alignment chart." As the first of these names implies, the reference axes are parallel to each other.

TABLE I. COMPUTATIONS FOR A SPECIFIC CHART AT WASHINGTON UNIVERSITY, ST. LOUIS, LATITUDE 38°38′ N

h	Sin ϕ Sin h	Cos ϕ Cos h	Cos ϕ Cos h − 1	xd	y
0	0	0.781	−0.219	−0.124	0
10	0.109	0.770	−0.230	−0.130	0.063
20	0.213	0.732	−0.268	−0.155	0.123
30	0.312	0.674	−0.326	−0.195	0.187
40	0.402	0.597	−0.403	−0.253	0.252
50	0.478	0.501	−0.499	−0.332	0.318
60	0.540	0.390	−0.610	−0.440	0.388
70	0.587	0.267	−0.733	−0.577	0.469
80	0.615	0.136	−0.864	−0.762	0.543
90	0.624	0	−1.0	−1.0	0.624

A most elemental conception of the parallel coordinate system is illustrated by the graph of a straight line. This graph appears as a point with a straight-line directrix rotating about it, giving values of x for corresponding values of y. Such charts of linear functions are easily constructed with the knowledge of a few simple principles. Equations of more than two variables, however, often do not lend themselves so readily to graphical solution. If they are plotted by the common rectangular system, the graphs are usually rendered unworkable, at least in part, by very poor intersections. If the charts are laid out with the use of parallel coordinates, this difficulty will often be obviated, but the actual construction of such charts is sometimes a complicated problem.

Consider the equations for solving the spherical triangle encountered in determining the azimuth and hour-angle from an astronomical observation.

$$\cos Z = \frac{\sin \delta}{\cos \phi \cos h} - \tan \phi \tan h \quad \ldots\ldots\ldots\ldots [1]$$

$$\cos t = \frac{\sin h}{\cos \phi \cos \delta} - \tan \phi \tan \delta \quad \ldots\ldots\ldots\ldots [2]$$

in which Z is azimuth; δ, declination; ϕ, latitude; h, altitude; and t, hour angle. If these equations are studied it becomes evident that they may be arranged to fit the form of a linear function. This does not mean that all the axes will be straight lines but that the coordinates of points on the axes are determinable.

To produce a universal chart that can be used anywhere in the world, it is necessary to develop a family of curves for variations in latitude, these curves to be bounded by two parallel, straight-line axes. Such a chart is shown in Fig. 1. A curved-line axis is plotted for each 5-deg variation in latitude, making interpolation necessary between these values.

Referring to Fig. 1, the method of use follows:

If latitude, altitude, and declination are given and the azimuth is desired, connect with a straight edge or a thread the proper value on the declination scale with the intersection of latitude and altitude values on the central curved-line scales and then read the desired value on the azimuth scale. On the other hand, if latitude, altitude, and declination are given and it is desired to find the hour angle the same method applies, since the formulas for hour angle and azimuth are in the same form, if altitude is read for declination and hour angle for azimuth.

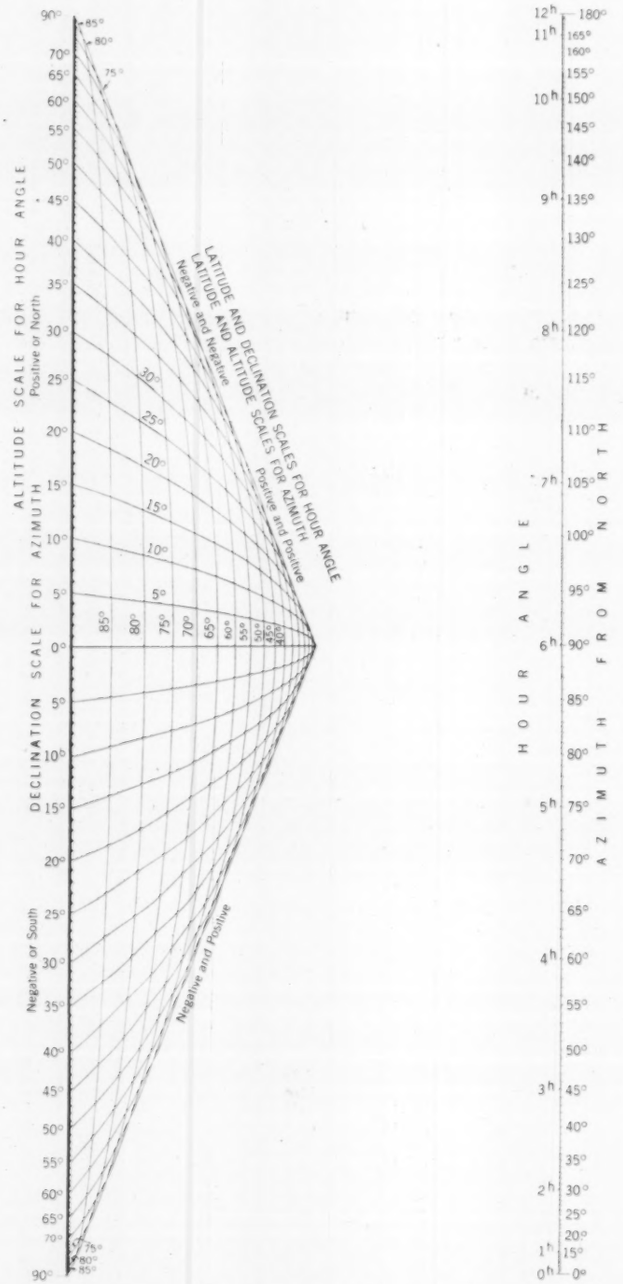


FIG. 1. NOMOGRAPH FOR SOLUTION OF AZIMUTH AND HOUR-ANGLE FORMULAS

Computations may be made from other combinations of observations by reading in the proper order. It may also be observed that the chart presents graphically the relative influence of errors in observation on accuracy of computations.

If many observations are to be made from a given point with a constant latitude, a more workable chart may be prepared having only one curved-line scale. This curved-line scale itself may then be calibrated to the

desired accuracy. The necessary computations for a curved-line axis at the latitude of Washington University in St. Louis are shown in Table I, in which

$$y = \frac{\sin \phi \sin h}{1 + \cos \phi \cos h} \quad \ldots\ldots\ldots\ldots\ldots\ldots [3]$$

and

$$x = d\left(\frac{\cos \phi \cos h - 1}{\cos \phi \cos h + 1}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots [4]$$

As an aid to the double interpolation necessary with the curved-line scales, the suggested procedure for using the chart is to connect with a straight edge zero degrees on the azimuth scale with 90 deg minus the positive arithmetic difference of the latitude and altitude on the declination scale and draw a short straight line across the movable intersection. Then connect 180 deg on the azimuth scale with the sum of the latitude and altitude minus 90 deg on the declination scale and draw another short straight line to intersect that previously drawn. The intersection of these two lines is the required point.

The general method of procedure outlined in this article was suggested by C. B. Schmeltzer, of Urbana, Ill.

Vertical Curves by Means of Charts

By ERIC E. BOTTOMS, JUN. AM. SOC. C.E.
U. S. ENGINEERS OFFICE, CHICAGO, ILL.

FREQUENTLY the length of bridge approaches is so limited by surrounding conditions, especially in cities, that it becomes necessary to extend a vertical curve well onto the bridge. When this is done the depth of the cross or floor beams of the bridge must be altered from the standard or economic depth for the structure. By the usual method, considerable computation is necessary to determine the amount of alteration. By using the accompanying charts, (*a*) and (*b*) of Fig. 1, the results can be determined readily and accurately. As a working example, consider the following, illustrated by Fig. 2. A curve is 400 ft long and the algebraic difference in the grades is 1 per cent. Find the tangent offset of a parabolic curve at a point 140 ft distant from the point of tangent. Enter the chart Fig. 1(*a*) at 140 ft from the point of curve or point of tangent on the lower edge of the chart. Follow this ordinate upward until it intersects the line for a length of curve of 400 ft. Follow this coordinate to the left and read the tangent offset, No. 7, on the edge of the chart.

Enter the chart, Fig. 1(*b*), at 1.0 per cent, the algebraic difference in the grades. Follow this ordinate upward until it intersects the line for a length of curve of 400 ft. Follow this coordinate to the right, in this case, until it intersects the offset line No. 7. Follow this ordinate upward and read the tangent offset, 0.245 ft on the upper edge of the chart. Subtract or add (depending on the direction of the grade) this amount from the calculated elevation of the tangent produced at 140 ft distant from the beginning or end of the curve, getting the answers 95.315 and 95.195, respectively.

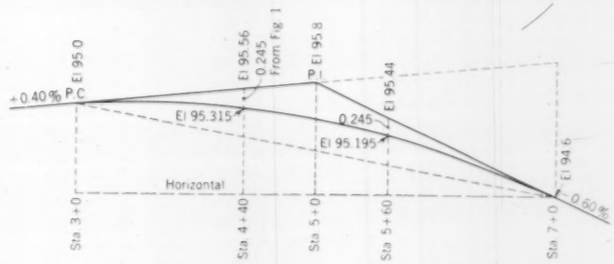
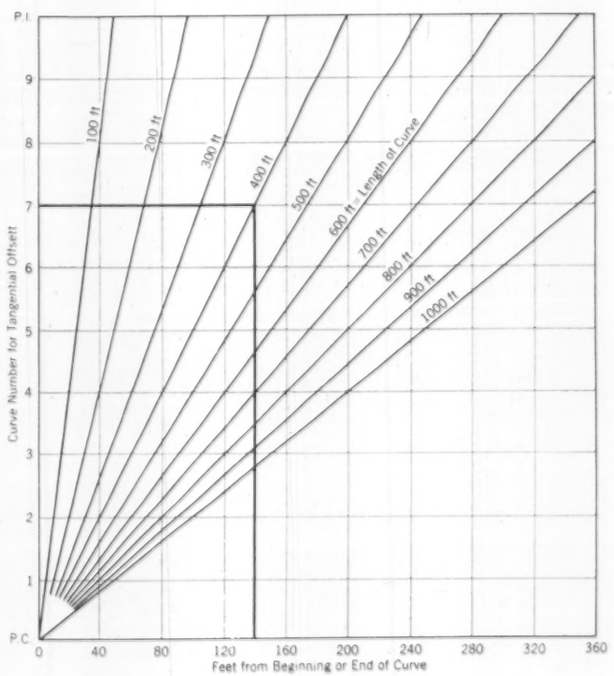


FIG. 2. EXAMPLE OF A VERTICAL CURVE PROBLEM



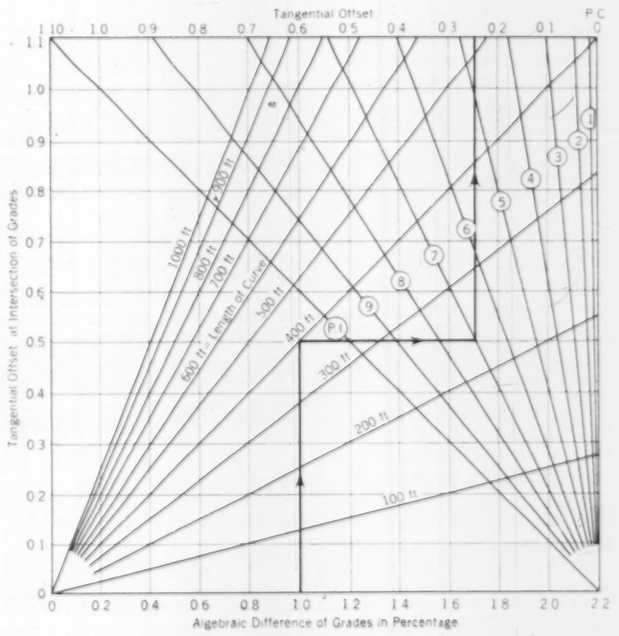


FIG. 1(*a*) and (*b*). CHARTS FOR DETERMINING TANGENTIAL OFFSETS TO VERTICAL CURVES

OUR READERS SAY—

In Comment on Papers, Society Affairs, and Related Professional Interests

Earth Pressure on Retaining Walls

To the Editor: In reference to the article by Mr. Sun on "Coulomb's Theory of Earth Pressure Rectified," in the May issue, the following comments may be of interest.

The correct analysis of retaining walls would necessitate the determination of earth pressure before the earth fill is ruptured. This would require a knowledge of the elastic behavior of the wall under the pressure of the yielding earth fill and of the foundation before any sliding takes place. Thus the problem is statically indeterminate. Coulomb's theory, on the other hand, presupposes that the earth behind the wall has been ruptured, that the angle of internal friction is equal to the angle of repose, and that the prism of rupture will be of maximum pressure. In this way a problem of great complexity is reduced to extreme simplicity at the expense of accuracy.

By assuming a rigid, unyielding wall and a planar surface of rupture, the weight of the wedge of earth, the reaction of this wedge on the wall, and the surface of rupture do not always meet in one point. Equilibrium, therefore, will not exist. However, by assuming a curved surface of rupture as really occurs in nature, this discrepancy can be removed. For the determination of earth pressure under the assumption of circular surfaces of rupture, reference is made to the investigations of Prof. W. Fellenius published in *Erdstatische Berechnungen mit Reibung und Kohaesion (Adhaesion) und unter Annahme kreiszylindrischer Gleitflaechen* (Berlin, 1927).

If the inner face of the wall is vertical and the surface of the fill horizontal, then the resultant of earth pressure, omitting friction, is horizontal and the three forces, mentioned previously, intersect at one point. In this special case, therefore, both Rankine's and Coulomb's theories give identical results and, in addition, satisfy the conditions of statical equilibrium. In fact, as H. Krey has shown in his *Erddruck, Erdwiderstand und Tragfaehigkeit des Baugrundes* (Vierte Auflage von J. Ehrenberg, Berlin, 1932, page 52), by the aid of the ellipse of stress, Rankine's theory is a special case of the more general Coulomb's theory, so that the question of preference between the two theories in the design of retaining walls has been settled definitely. In view of this fact, Mr. Sun's statement that in general both theories are identical is rather startling. Rankine's theory requires that the direction of the earth pressure be parallel to the surface of the fill. This immediately determines the frictional resistance on the inner surface of the wall, which in general does not correspond to the actual conditions. No such restrictions are necessary in Coulomb's theory.

It would seem that Mr. Sun's assumption that the trapezoidal distribution of earth pressure on the wall and the plane of rupture can scarcely be probable. Since the earth pressure depends primarily on the mass, and consequently on the depth of the fill, it cannot be developed at the top of the fill, where this depth is zero.

A. Floris

Los Angeles, Calif.
October 1, 1934

To the Editor: So time-honored an institution has Coulomb's theory become that some engineers would defend it against all criticism to the extent of disregarding Newton's laws of motion. Mr. Floris' discussion of my article, in the May issue, may be answered by reiterating the fundamental conception that underlies the rectified theory.

It has been assumed by Coulomb and his followers that an earth wedge behind the wall tends to rupture—not after it has been ruptured as Mr. Floris writes—in such a way as to give maximum thrust on the wall. Further, he assumed (1) that the surface of rupture is a plane; (2) that the angle made by the thrust with the normal to the wall is the angle of friction between earth and wall; and (3) that the resultant pressure acts at $\frac{1}{3}\ h$ from the base of the wall.

In order completely to satisfy the conditions of static equilibrium, which the external forces acting on a body at rest must fulfill as long as Newton's Second Law of Motion is valid, one of the above assumptions becomes superfluous and therefore must be abandoned.

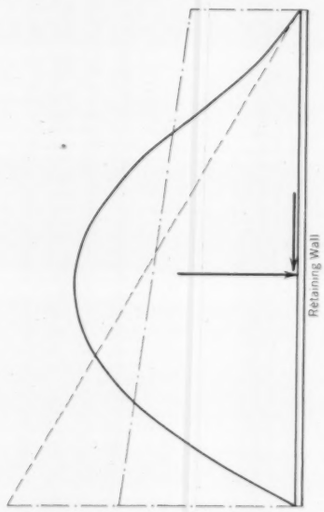


Fig. 1. Distribution of Earth Pressure on Wall, Tests, and Assumptions

By eliminating the second assumption, the theory becomes identical with Rankine's, and the earth pressure on any vertical plane—not on any plane as Mr. Floris indicates—is always parallel to the surface of the fill. By eliminating the third assumption the rectified theory is one of the possible results.

Thanks are due Mr. Floris for pointing out another means of eliminating the first assumption, that is, by assuming a curved surface of rupture. The accompanying diagram, Fig. 1, shows the comparison of the two assumptions with the actual distribution of pressure of dry sand before rupture as measured by Charles Terzaghi, M. Am. Soc. C.E., in a series of tests on retaining walls, the magnitude of the resultant pressure being the same in the three cases. Although the assumption of trapezoidal distribution is untrue, the point of application of the resultant pressure determined by it is remarkably close to the test results.

Pao-Tse Sun
Engineer of Bridges

Tsingtao, China
October 21, 1934

Correct Equations for Moment of Inertia

To the Editor: I note two typographical errors which appeared in my article, "Moment of Inertia of Corrugated Sheets," in the September issue. Equations 11 and 12 should read:

$$C_6 = \left[\left(6\alpha + \sin 2\alpha - 8\sin\alpha - 4\frac{\tan^3\alpha\sin^2\alpha}{3}\right)q^3 + (4\sin\alpha + k\tan^3\alpha\sin\alpha - 4\alpha)q^2 + \left(\alpha - \frac{k^2\tan^3\alpha}{4}\right)q + \frac{k^3\tan^2\alpha}{48\cos\alpha}\right] \div k \quad [11]$$

$$q = \frac{(k\tan\alpha - 2)}{4\ \text{exsec}\ \alpha} \quad [12]$$

H. B. Blodgett, Assoc. M. Am. Soc. C.E.
Assistant Professor of Civil Engineering
South Dakota State College

Brookings, S.D.
October 17, 1934

Early Notes on Surveying

DEAR SIR: In connection with Mr. Perry's article on "The Maryland–West Virginia Boundary," in the June issue, the following note on the boundary line between Virginia and North Carolina may be interesting.

In 1829 William Byrd, of Virginia, was a member of a survey party to determine the boundary line between the two states. At that time he wrote a report of the work of the survey, which was published in 1841 as *The History of the Dividing Line*. In it he mentions a certain Mr. Wilson as follows:

"This worthy Person lives within sight of the Dismal, in the skirts whereof his Stocks range and Maintain themselves all the Winter and yet he knew as little of it as he did of Terra Australis Incognito. He told us a Canterbury Tale of a North Briton, whose Curiosity Spurr'd him a long way into this great Desart, as he called it, near 20 years ago, but he having no compass, nor seeing the Sun for several Days Together, wandered about till he was almost Famisht; but at last he bethought himself of a secret his Countrymen make use of to Pilot themselves in a Dark day.

"He took a fat Louse out of his collar and expos'd it to the open Day on a piece of White Paper which he brought along with him for his Journal. The poor Insect having no Eyelids, turn'd himself about till he found the Darkest Part of the Heavens, and so made the best of his way towards the North. By this direction he Steer'd himself Safe out, and gave such a frightful account of the Monsters he saw and the Distresses he underwent, that no Mortall since has been hardy enough to go upon the like dangerous Discovery."

The capitalization, punctuation, and spelling are as in the original.

CHARLES D. PURDON, M. Am. Soc. C.E.

St. Louis, Mo.
October 23, 1934

Gaging Stations in Canada

TO THE EDITOR: The article on Canadian aspects of the Columbia River drainage problem by Major MacDonald, in the September issue, is very illuminating. All water problems concerning navigation, the development of water power, irrigation possibilities, and the control of floods are dependent on basic stream-flow data, and it is therefore essential that these data be available for any hydraulic studies.

The Dominion Water Power and Hydrometric Bureau of the Department of the Interior, in cooperation with the different provinces, maintains gaging stations on the principal lakes and rivers throughout Canada. The method of stream gaging is similar to that of the U. S. Geological Survey. There are 13 stations in the Columbia River area, and records of them have been available since 1913. As the result of an agreement made in 1930 between Canada and the United States, international gaging stations have been established to obtain basic data on the utilization of water flowing across the boundary line west of the Great Lakes. Seventeen such stations are maintained west of the Rocky Mountains. These are shown in Fig. 1. Since these international stations are maintained under the joint supervision of the U. S. Geological Survey and the Dominion Water Power and Hydrometric Bureau, basic stream-flow data are immediately available to both countries.

Extensive hydraulic studies have been carried out both above and below Kootenay Lake. These studies have been made in connection with the application of the West Kootenay Power and Light Company, now before the International Joint Commission, for permission to utilize its recently constructed power dam at Corra Linn for the storage in Kootenay Lake of 6 ft above low water.

The United States and Canada recently made interesting studies of slope on the Columbia River between Birchbank, B.C., and the Little Dalles, Wash., a distance of 37 miles. These observations were made over a two-year range of stage. This year additional slope studies have been extended by Canada to Revelstoke, B.C., above the Arrow Lakes. From a study of these slope records it would appear that during high water backwater from the Little Dalles extends some distance above the international boundary line.

At the request of various interests, bulletins have been issued each spring for several years past. These give a rough synopsis of existing snow cover and anticipated run-off resulting therefrom on the Columbia and Fraser drainage systems, the two major streams in the province.

With the close cooperation of the Canadian Pacific Railway, the Canadian National Railways, and the department of the provincial government, a very satisfactory flood-warning service has been maintained on the Fraser River for a number of years. This same service could be developed on the Columbia River, and the anticipated flow at the international boundary might then be predicted several days in advance.

. Every country that carries on water power studies has its own particular method of computing potential water power. In Canada all estimates made by the bureau represent continuous 24-hr power at 80 per cent efficiency. They are based on calculations for "ordinary minimum flow" and for "ordinary six-month flow" over all the years for which records are available. The former is the average of the mean flow for the two lowest consecutive seven-day periods in each year, and the latter is the average of the mean flow for the lowest seven consecutive days in the lowest of the six high months in each year.

The World Power Conference is now preparing statistics on power resources throughout the world. These will include data on water-power sites, potential power resources, and gross capacity of power sites, computed for three different rates of flow—95 per cent of the time, 50 per cent of the time, and arithmetical mean flow—as defined by the International Electro-Technical Commission. Publication of the statistical year book of the World Power Conference giving these data for the various subscribing nations will be awaited with interest.

C. E. WEBB
District Chief Engineer, Dominion Water Power and Hydrometric Bureau, Department of the Interior

Vancouver, B.C.
October 28, 1934

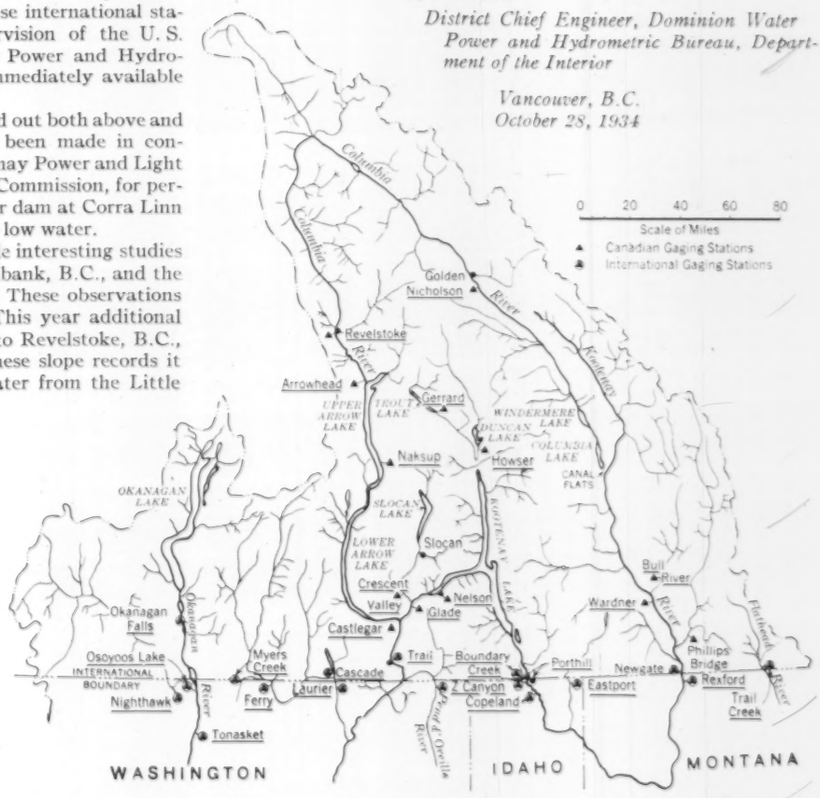


FIG. 1. GAGING STATION ON THE COLUMBIA RIVER IN CANADA

SOCIETY AFFAIRS

Official and Semi-Official

Advance Plans for Annual Meeting

As NEW details of the plans being developed for the 1935 Annual Meeting come to light, the various sessions and social events gain increased value and attractiveness. A few of the more important features can now be divulged.

A number of events, by virtue of their continued popularity year after year, are fixtures on every Annual Meeting program. One such time-honored feature, scheduled this year for the annual business meeting, to be held on the morning of January 16, 1935, includes recognition of the various distinctions that have come to engineers during the year through the medium of the Society. In an atmosphere of great dignity Honorary Membership will be conferred on those elected to this grade. The award of medals and prizes is another event in which the Society and its Members delight to do honor to those who have well earned it. Six such prizes are to be bestowed at this business meeting. Finally, the announcement of the election of Society officers will be made and the induction of the new President will follow immediately after the business session.

Due to the demand for time to present the many technical features of the various Division programs, and to the desirability of holding all these sessions in the Engineering Societies Building itself, it has been necessary to devote additional periods to these meetings. This year, not only morning and afternoon sessions on Thursday are to be devoted to Technical Division meetings, but Wednesday afternoon, usually given over to general Society affairs, has also been surrendered to the Division programs. All the meetings promise exceptional opportunities for obtaining the last word in engineering knowledge, and full details of the sessions will be found in the official program to be published in the January issue.

It goes without saying that the regulation social events will be appreciated this year as in the past. Included in the plans are a luncheon to be held in the Engineering Societies Building on Wednesday; a dinner and dance at the Hotel Roosevelt on Wednesday evening; an address and smoker in the Engineering Societies Auditorium on Thursday evening; and an all-day excursion on Friday. Thursday afternoon the visiting ladies will enjoy a fashion show and tea, followed by an entertainment and bridge in the evening, at the Engineering Woman's Club. Saturday morning will be given over to various short inspection trips in and around New York City. A number of college reunion dinners have also been planned, for which purpose Friday evening is being reserved.

In the latter part of December an identification certificate, enabling the purchase of special round-trip rail transportation to New York, will be mailed to the membership together with a brief announcement of the various features of the Annual Meeting. The final official progam will be found in the January 1935 issue of CIVIL ENGINEERING.

BERMUDA IN THE WINTER TIME

As mentioned briefly in the November number, plans have been perfected for a short trip to Bermuda following the meeting, this voyage to be open to Members and their guests at special rates on the all-expense basis. Those who take advantage of this trip will leave New York on Saturday afternoon, January 19,

A TRIP TO BERMUDA PLANNED TO FOLLOW ANNUAL MEETING
View of Hamilton Harbor from Grounds of the Bermudiana Hotel. Private Yacht in Central Foreground

1935, on the "Monarch of Bermuda," spending Sunday at sea and arriving at Hamilton early in the morning of Monday, January 21. The party will be accommodated at the Hotel Bermudiana, and the remainder of Monday and all of Tuesday will be available for sightseeing, golf, and other diversions. Leaving Hamilton by train on Wednesday morning, January 23, for St. George, the group will have luncheon at the Hotel St. George. The voyagers will then board the same ship, "Monarch of Bermuda," for the return trip, arriving in New York on Friday morning, January 25. A special, all-inclusive price has been arranged for the whole trip. This includes round-trip transportation, stateroom with private bath, all meals on shipboard, room with private bath and all meals at the Hotel Bermudiana, the U. S. Government tax, rail transportation from Hamilton to St. George, luncheon at the Hotel St. George, and tender transfer to the "Monarch of Bermuda." Those interested in this cruise should write to the Secretary of the Society promptly in order to be assured of accommodations.

New Honorary Members

BY RECENT action of the Board of Direction the Society has gained three eminent additions to its illustrious list of Honorary Members in the persons of William L. Darling and Milo S. Ketchum, Members Am. Soc. C.E., and Robert Ridgway, Past-President, Am. Soc. C.E. Although these men are active Members of long standing in the Society, a brief reminder of their notable accomplishments is in order.

Trained in the East at Worcester Polytechnic Institute, Mr. Darling has confined his engineering experience almost exclusively to the Middle and Far West. He is known as one of the deans of railway engineering in America, having engaged continuously in this work since 1878. His valuable services have been in demand on a great many railroads, but particularly on the Rock Island System and on the Northern Pacific. Since his retirement in 1916, he has served on the U. S. Naval Consulting Board and with the U. S. Commission of Railway Experts in Russia, in addition to his main work as consulting engineer in St. Paul, Minn. Mr. Darling has been a Member of the Society since 1892, and was a Director from 1917 to 1919.

Few men are better known in the engineering educational world of America than Milo S. Ketchum. Almost continuously since his graduation, he has held positions of increasing responsibility in educational work. For nearly 30 years, he has been head of the engineering work, successively in the University of Colorado, in the civil engineering department of the University of Pennsylvania, and since 1922, as dean of the College of Engineering and director of the Engineering Experiment Station at his alma mater, the University of Illinois. He is now dean emeritus. He is known widely also for his numerous publications in the field of structural engineering. His handbooks are stand-bys among practicing engineers. As an officer of the Society, he has served as Director from 1918 to 1920 and as Vice-President from 1925 to 1926.

Beloved by Members of the Society, Robert Ridgway has risen by virtue of character and innate ability to the top of the profession. A brief period in his early experience was spent on railroading in the West, but since 1885 he has been engaged continuously on major engineering works in and about New York City. His two special fields have been the New York water supply and the New York subway systems, in which he has spent almost 50 years. For 15 years prior to 1900 he was engaged on the aqueduct work; he returned to it in 1905 and shortly thereafter was made department engineer for the northern part of the tremendous Catskill project. Similarly, he was engaged on work for the New York subways from 1900 to 1905 and returned to the work in 1912 as engineer of subway construction. From 1921 onward he was chief engineer and, finally, consulting engineer. He also served as consultant on many major engineering projects in this country and abroad. Although he is without a formal college education, he has received three honorary degrees, including that of doctor of engineering. He also has the Japanese decoration, "The Order of the Rising Sun." In addition to numerous committee activities, he has served as officer of the Society on three occasions: as Director from 1911 to 1913, as Vice-President from 1922 to 1923, and as President in 1925.

In accordance with the practice in former years, Honorary Membership will be conferred on these eminent engineers at the annual business meeting of the Society, which will be held on January 16, 1935, at the time of the Annual Meeting. This ceremony never ceases to be an inspiration to young and old Members alike. More complete biographies of the new Honorary Members will appear in the January issue of CIVIL ENGINEERING.

Society Prizes and Awards Announced

BY RECENT action of the Board of Direction, the selection of recipients for Society medals and prizes has been made for the current year. The basis for selection has been the excellence of papers printed in Volumes 97 and 98 of TRANSACTIONS for the year 1933. The authors and the papers for which the awards are made are as follows:

Norman Medal—To Leon S. Moisseiff, M. Am. Soc. C.E., for his paper, "George Washington Bridge—Design of the Towers."

J. James R. Croes Medal—To Harald M. Westergaard, M. Am. Soc. C.E., for his paper, "Water Pressures on Dams During Earthquakes."

Thomas Fitch Rowland Prize—to Miles I. Killmer, M. Am. Soc. C.E., for his paper, "Fulton Street, East River Tunnels, New York, N.Y."

James Laurie Prize—To E. Warren Bowden, M. Am. Soc. C.E., and Homer R. Seely, Assoc. M. Am. Soc. C.E., for their paper, "George Washington Bridge—Construction of the Steel Superstructure."

Arthur M. Wellington Prize—To J. C. Evans, Esq., for his paper, "George Washington Bridge—Approaches and Highway Connections."

Collingwood Prize for Juniors—To G. O. Wessenauer and G. H. Hickox, Juniors Am. Soc. C.E., for their paper, "Application of Duration Curves to Hydro-Electric Studies.

Official award of these prizes will take place as is customary on the first morning of the Annual Meeting, which this year will occur on January 16, 1935. Short biographical sketches of these men who have thus won recognition will appear in a later issue of CIVIL ENGINEERING.

Appointments of Society Representatives

O. E. HOVEY, M. Am. Soc. C.E., has accepted an appointment to serve as Society representative on the United Engineering Trustees, Inc.

Professional Records of Candidates for Office

ARTHUR SMITH TUTTLE

BORN March 26, 1865, at Burlington, Conn., Arthur S. Tuttle was graduated in 1885 from New York University, with the degrees of B.S. and C.E. From his graduation until 1901, he served in various engineering capacities on the development of the Brooklyn water supply. He then took charge of an investigation for the development of irrigation and water power in Hawaii. From 1902 to March 1933 he was connected with the Board of Estimate and

Apportionment of the City of New York as assistant engineer, deputy chief engineer, chief engineer, and consulting engineer.

As chief engineer of the Board of Estimate and Apportionment, he was the board's technical adviser in all matters relating to city planning, grade-crossing elimination, zoning, street improvements, sewers, sewage-treatment plants, and a variety of other engineering projects. Incidentally, he was chief engineer of the Narrows Tunnel and was in charge of the administrative work in connection with it from 1921 to 1925, when the work was terminated by an act of the state legislature.

He has represented the city on a large number of special committees, of many of which he has been chairman. The most important committees were those on traffic relief, transportation facilities, sewer capacity, main drainage, methods of sewage disposal in use in other cities, plans for the Wards Island Sewage Treatment Works, plans for the West Side Improvement (New York Central Railroad), elimination of grade crossings on Atlantic Avenue, New York approach to the George Washington Bridge, the Jamaica Bay Improvement, and aviation. Mr. Tuttle represented the city in the negotiations leading up to the agreement with the New York Central Railroad Company for the construction of the West Side Improvement.

From April 1933 to August 1933 he was a member of the New York City Emergency Work and Relief Administration. Since March 1933 he has been consulting engineer for the Citizens Budget Commission of the City of New York; and since August 1933 he has been New York State Engineer for the Federal Emergency Administration of Public Works, as well as resident project engineer for the Government on the construction of the Triborough Bridge, in New York City.

He has been consulting engineer for, and a member of the Board of Directors of, the National Meter Company, and he invented the Premier water meter for use on large mains. He is the author of various technical papers delivered before engineering societies, was chairman during 1919 and 1920 of the Engineering Council's Committee on Classification and Compensation of Engineers, and is a member of the Advisory Board of Municipal Sanitation.

He has been Director, Treasurer, and Vice-President of the Society, and president of the Metropolitan (New York) Section of the Society. He is a member of the Board of Trustees of the United Engineering Society (assistant treasurer); the Engineering Foundation Board; the American Water Works Association; Municipal Engineers of the City of New York (former president); American Shore and Beach Preservation Association (director); Brooklyn Engineers' Club; Municipal Club of Brooklyn (director and former president); New York University Council; New York University Alumni Federation (former president); Engineers' Club (trustee); Arkwright Club; Pleiades Club (director and former president); Phi Beta Kappa Fraternity; and Delta Phi Fraternity.

CHARLES B. BURDICK

BORN on March 6, 1874, in Chicago, Ill., Charles B. Burdick resided at Sterling, Ill., during his childhood and youth. He was graduated from the University of Illinois in June 1895, with the degree of B.S., in municipal and sanitary engineering. In 1912 he was awarded the degree of C.E.

Immediately after his graduation he entered the employ of John W. Alvord, M. Am. Soc. C.E., his present senior partner, and for the ensuing two years was an assistant on the design and supervision of construction of several small sewerage and water-supply projects. In September 1897, he entered the employ of the late John A. Cole, M. Am. Soc. C.E., as an assistant in the administration and improvement of several water-works companies. For the following five years he was engaged in preparing plans and in supervising construction under the direction of Mr. Cole, and in preparing inventories and valuations of several water-works properties.

In November 1902 the association with Mr. Alvord was renewed as a partnership and continued to 1922 under the firm name of Alvord and Burdick. From that time to the present the firm name has been Alvord, Burdick, and Howson, who have maintained an office in Chicago and have followed the general practice of hydraulic and sanitary engineering for utilities and municipalities. This work has included the development of new water supplies from various sources under widely varying conditions as well as the purification and softening of water. Their projects include development of a ground-water supply for Des Moines, Iowa; the preliminary investigation and estimates for the water supply of the East Bay cities near San Francisco; the new water works at Knoxville, Tenn.; all recent enlargements to the filtration plant and water-supply system of Louisville, Ky.; the new water-filtration plant for Milwaukee, Wis., now under construction; and other water supply and sewerage improvements in some two hundred cities and towns. Their work has also included numerous investigations, reports, and plans relating to flood relief for municipalities and conservancy districts, as well as municipal sewerage and drainage projects.

With John W. Alvord he is joint author of *Relief from Floods* (McGraw-Hill, 1918), and he has published several reports and papers on engineering subjects. He is former president of the Western Society of Engineers, the Illinois Society of Engineers, and the Chicago Engineers Club. He is also a member of the American Water Works Association.

IVAN C. CRAWFORD

ON June 2, 1886, Ivan C. Crawford was born in Leadville, Colo. After spending several of his boyhood years in Nova Scotia, Canada, he returned to the United States, where he received his high school and college education. Granted a bachelor's degree in civil engineering at the University of Colorado in 1912, he received the degree of civil engineer from the same institution in 1915.

Before entering college and during his undergraduate course, he engaged in metal mining in Colorado and worked on survey parties for the Oregon Short Line Railroad in Idaho. Following graduation, he was employed by the Illinois Central Railroad as a masonry inspector on bridge construction near New Orleans, La. The year 1915 found him holding a similar position with the same company, and he was employed by several other organizations during his early professional career.

He became instructor in civil engineering at his alma mater in the fall of 1912 and remained there until 1923, passing through the various teaching grades, including that of professor. He left Colorado to become Dean of the College of Engineering and Professor of Civil Engineering at the University of Idaho. When the Engineering Experiment Station of this university was created in 1928 he was appointed its director.

Entering military service as a captain in 1916, he was advanced to the grade of major and went to France with the 115th Engineer Regiment. During this period, in the position of chief of the General Buildings Section of the War Damages Division of the Peace Commission, he served in Belgium on valuation work.

He has been active in Society affairs in Denver, Colo., and in Spokane, Wash. The Colorado Section chose him as president in 1923, a post he never occupied due to a change of location in that year. The presidency of the Spokane Section came to him in 1933.

Granted leave of absence by the University of Idaho in August 1933, Mr. Crawford was appointed State Engineer of Idaho for the Federal Emergency Administration of Public Works. In addition to that assignment, he has also been Acting State Engineer Inspector, PWA, and representative in Idaho for the U. S. Coast and Geodetic Survey during the past year.

OFFICIAL NOMINEES—1935

For President, Arther S. Tuttle of New York, N.Y.

For Vice-Presidents:

Zone II, D. H. Sawyer of Washington, D.C.
Zone III, Henry E. Riggs of Ann Arbor, Mich.

For Directors:

District 3, C. Arthur Poole of Rochester, New York
District 5, Herman Stabler of Washington, D.C.
District 7, James L. Ferebee of Madison, Wis.
District 8, Charles B. Burdick of Chicago, Ill.
District 9, H. S. Morse of Indianapolis, Ind.
District 12, Ivan C. Crawford of Moscow, Idaho
District 16, Theodore A. Leisen of Omaha, Nebr.

He is the author of technical articles, which have appeared in the *Journal of Engineering Education, The Military Engineer, Land Grant College Proceedings*, and in various college technical publications.

JAMES L. FEREBEE

JAMES L. FEREBEE was born in Camden County, N.C., on December 3, 1880. He received his early education in public and private schools and entered the North Carolina State College of Engineering in 1899, graduating in 1902 with the degree of bachelor of engineering.

From 1902 to 1904 he was with the Durham and Charlotte Railroad Company, and during 1905 and 1906 he was engineer-surveyor for the John L. Roper Lumber Company and the Roanoke Railroad and Lumber Company, both of Norfolk, Va. Following this, he was employed until 1909 as assistant engineer in the Water Department of the City of Wilmington, Del. Thereafter for one year he was a contractor for macadam highway work in the State of New York. Upon his return to the Wilmington Water Department, he remained for a year on the construction of the slow sand filters, and was then engaged as assistant to the city engineer in charge of private surveys and on street paving work. Beginning in 1910, he was employed by the late T. Chalkley Hatton, M. Am. Soc. C.E., consulting engineer of Wilmington, as resident engineer on a storm water drainage system for Atlantic City, N.J.

In 1914 Mr. Hatton assumed the position of chief engineer of the Sewerage Commission of the City of Milwaukee, and in April 1915, Mr. Ferebee joined him in Milwaukee as principal assistant engineer on the design and construction of a complete intercepting sewer system and of one of the early large activated sludge plants.

This engagement continued to 1923 when he again formed a construction company and was engaged for three years in constructing tunnels on the extension of the Metropolitan Sewerage System of the County of Milwaukee. Having completed this work, he assumed in 1926 the position of Commissioner of Public Works of the City of West Allis, a part of the Milwaukee Metropolitan Area, doing considerable work in street improvements, storm sewer systems, and the extension of the water-supply system. Simultaneously, from 1928 to 1930, he was a member of the Metropolitan Sewerage Commission of the County of Milwaukee, having been appointed by the governor.

On September 1, 1930, he became chief engineer of this commission and of the Sewerage Commission of the City of Milwaukee, having continued in this capacity since that date. During this period the extension of the sewage disposal plant has been designed and constructed.

On August 12, 1933 he was appointed State Engineer of the Public Works Administration for the State of Wisconsin on leave of absence from his regular work. Upon the death of Mr. Hatton, at that time acting chief engineer of the Sewerage Commission, Mr. Ferebee offered his resignation as State Engineer, which was accepted September 15, 1934, and actively resumed his duties as chief engineer of the Sewerage Commission and the Metropolitan Commission.

He was active in working for a licensing law for architects and civil engineers in Wisconsin. In September 1931 he was appointed a member of the Board of Examiners of Architects and Civil Engineers and has been continuously a member of this board since its creation, being chairman of the Civil Engineering Division. He was also a director of the National Council of State Boards of Engineering Examiners for 1934.

He is a member of the Milwaukee Engineers' Society, the Professional Men's Club, the Central States Sewage Works Association, the American Society of Municipal Engineers, and the American Society of Military Engineers.

THEODORE A. LEISEN

THEODORE A. LEISEN was born in Philadelphia, Pa., on February 17, 1864. After leaving high school, he took up special studies in engineering under the guidance of two former professors of engineering of the defunct Polytechnic College of Philadelphia and, during that period, obtained practical experience on general surveys and railroad location.

In 1883 he served as assistant engineer in the Engineering Department of the City of Wilmington, Del., and in the same year left for South America to accept the position of assistant engineer of the Ferro Carril de Antioquia, Republic of Colombia, on location and construction. In 1886 he was transferred to the Barranquilla Railway and Pier Company, in Barranquilla, Puerto Colombia, first as assistant engineer on the location and construction of an extension of the railroad to its ocean terminal, and later as chief engineer in charge of terminals. He resigned in March 1890.

In June 1890, after a vacation in England and France, he accepted a position as assistant engineer in Wilmington, Del., on the design and construction of the sewer system; and from 1893 to 1903, he served as chief engineer of the Park Department of the same city in designing roads, bridges, and miscellaneous park works. During the latter part of this period he also acted as consulting engineer for the Water Department. From May 1904 to July 1908, he was chief engineer of this department, with full charge of the design and construction of such structures as filtration plants, pumping stations, and reservoirs.

He was appointed chief engineer of the Louisville Water Company, with headquarters in Louisville, Ky., in August 1908, and served in that capacity until April 1914, when he was called to Detroit, Mich., to become general superintendent of the Detroit Water Board. He remained there in active charge until October 1917, when he was commissioned a major in the Construction Division of the U. S. Army (later commissioned Lieutenant-Colonel and Colonel, O. R. C.), and assigned to Camp Custer, Mich., as Utilities Officer and Constructing Quartermaster. In addition to the routine work, he constructed the second addition to the camp, at a saving of nearly two million dollars below the cost estimated by the Government.

On being discharged from active duty in the Army in June 1919, he returned to Detroit as consulting engineer to take charge of the design and construction of the filtration plant and pumping station, remaining there until the completion of this work in 1923. In November 1923 he was appointed general manager of the Metropolitan Utilities District of Omaha, Nebr., having under his charge the entire construction and operation of the water works, gas plant, and municipal ice plant, which position he still occupies.

He is a former president of the Detroit and Nebraska Sections of the Society, a member of the American Society of Mechanical Engineers, a member and former president of the American Water Works Association, a member of the Omaha Engineers Club, and an honorary member and former president of the Engineers and Architects Club of Louisville, Ky. For the past three years he has been a member of the Society's Committee on Student Chapters.

HOWARD S. MORSE

BORN at Dedham, Mass., on June 21, 1881, Howard S. Morse was graduated from Massachusetts Institute of Technology in 1903, with the S.B. degree. Immediately following graduation, he returned to his alma mater for one year as an assistant in the Department of Civil Engineering.

From 1904 to 1908 he was with the U. S. Reclamation Service in North Dakota and Montana in connection with the preliminary surveys and construction of the Lower Yellowstone Irrigation Project. He next served as resident engineer with the Commissioners of Sewerage of Louisville, Ky., remaining in that position until 1912. Successively, he has been principal assistant engineer in charge of sewerage, City of Cincinnati, Ohio; director of the Cincinnati Bureau of Municipal Research; engineer for the Detroit Bureau of Governmental Research; director of Public Service, City of Akron, Ohio; and since 1925, manager of the Indianapolis Water Company of Indianapolis, Ind.

He was a member of the Louisville, Cincinnati, Detroit, and Akron engineering societies during his residence in those cities before the formation of Local Sections, and at present is a member and director of the American Water Works Association.

C. ARTHUR POOLE

C. ARTHUR POOLE was born in Rochester, N.Y., on June 23, 1874. He was graduated from Princeton University in 1895 with the degree of C.E. Following his graduation, he was employed for several years in the office of the State Engineer and Surveyor of New York during the improvement of the old Erie Canal. From 1899 to 1904 he was largely engaged in railroad work, serving in various capacities both on location and construction. During this period he was with the New York Central Railroad for a year and a half and spent about two years in Norway engaged in the construction of a railroad, harbor, and docks.

In 1904 he returned to the New York State Department of Engineering, where he remained until 1909. This was during the construction of the New York State Barge Canal. He served as assistant engineer on the preliminary work and was resident engineer on construction for two years, having his headquarters at Waterford, N.Y. From 1910 to 1911, he was engineer for the Ferguson Contracting Company, general contractors, with offices in New York, N.Y.

In the spring of 1911 Mr. Poole returned to his native city and began a period of service with the city of Rochester that lasted continuously for nearly 23 years. For six years he was in charge of the design and construction of a new sewage system and disposal works. In 1918 he became city engineer. In 1928 he was appointed consulting engineer to the city, and in 1932, city manager. In 1933 he again became city engineer, retiring from this position in February of this year. At present he is resident engineer-inspector for the Federal Emergency Administration of Public Works.

During the World War he served as a Captain in the Engineer Corps, U. S. Army, being assigned to the 150th Engineers.

He is a former president of the Rochester Section of the Society. He is also a member and former president of the American Society of Municipal Engineers; a member and former director of the American Association of Engineers; a member and former president of the Rochester Engineering Society; and a member of the Princeton Engineering Association, the American Water Works Association, and the American Society of Military Engineers.

HENRY EARLE RIGGS

BORN at Lawrence, Kans., May 8, 1865, Henry Earle Riggs received the degree of A.B. from the University of Kansas, and of C.E. from the University of Michigan. He was on railway construction and maintenance in Nebraska, Missouri, and Texas from 1887 to 1890, and chief engineer of a 300-mile railroad in Michigan from 1890 to 1896. He was a member of the firm of Riggs and Sherman, consulting engineers, of Toledo, Ohio, from 1896 to 1912, engaged in the design and construction of steam and electric railways, harbor improvements, water works, and sewage works. From May 1, 1912, to June 30, 1930, he was Professor of Civil Engineering, and head of the Department of Civil Engineering at the University of Michigan. On the latter date he retired from active administrative work with the title of Honorary Professor of Civil Engineering.

Since 1908 his personal work has been largely in valuation and in the preparation of cases dealing with theories of valuation and depreciation. He has been retained by many carriers on cases involving the Federal valuation of railroads and recapture of excess profits, among them the New York Central, the Illinois Central, the Norfolk and Western, the Chesapeake and Ohio, the St. Louis–San Francisco, the Pere Marquette, and the Bangor and Aroostook. He has been retained on public utility rate cases by the state commissions of Michigan, Georgia, and New York, and has made valuations for and represented in litigation the Georgia Power Company, the Alabama Power Company, the Carolina Power and Light Company, and other power corporations. He was appointed by the U. S. Circuit Court to make valuations and report on the Kansas City Street Railways.

He has acted as consulting engineer for the cities of Detroit, Battle Creek, and Pontiac, Mich., on railroad grade-separation projects, and as a member of the board of consulting engineers of the Belle Isle Bridge, across the Detroit River.

He is the author of a paper on "Valuation of Public Service Properties," in Vol. 72 of TRANSACTIONS (1911); of a volume on *Depreciation*, published in 1922; and of a number of papers on valuation, depreciation, and allied subjects in *Public Utilities Fortnightly* and *Railway Age*. He served from 1914 to 1917 as a member of the Society's Special Committee on Theories and Methods of Valuation and was one of the joint authors of the report of that committee, which was published in Vol. 81 of TRANSACTIONS.

He is a former president of the Detroit Section of the Society and of the Michigan Engineering Society, and a member of the American Railway Engineering Association, the Society for the Promotion of Engineering Education, the American Transit Association, and the Detroit Engineering Society.

DONALD HUBBARD SAWYER

ON August 26, 1879, Donald H. Sawyer was born in Mt. Pulaski, Ill. His early education was obtained in Oak Park, Ill., and he subsequently attended the University of Illinois, from which he was graduated in 1902, with the degree of B.S. in civil engineering. For a year prior to going to college, he was employed by the engineering firm of Alvord and Shields in Chicago.

Following graduation, he was with Alexander Potter, M. Am. Soc. C.E., of New York, N.Y., as inspector on a sewerage system serving a number of towns in New Jersey. In 1903 he was in charge of the building operations of the National Home for Disabled Volunteer Soldiers in Johnson City, Tenn. He then served as city engineer and as superintendent of the water and light plants of Paris, Ill. After this he was with the Illinois Traction System until 1910, rising to the position of chief engineer in charge of construction.

From 1910 to 1917 he was a partner in the firm of Sawyer Brothers, with offices in Seattle and Spokane, Wash., where he was engaged in the design and supervision of irrigation and power plants and in general practice on municipal improvements. In the spring of 1917 he entered the U. S. Army, successively as Constructing Quartermaster at Camp Grant, Rockford, Ill.; Camp Bragg, Fayetteville, N.C.; and the nitrate plant at Cincinnati, Ohio. He resigned in the fall of 1919 and was commissioned a colonel in the Reserve Corps.

For two years he was with the James Stewart Company, of New York, N.Y., on building operations. He resigned to accept the position of secretary of the Associated General Contractors of America, with headquarters in Washington, D.C. He then became secretary of the Heating Board of Trade of New York, resigning from this position in the summer of 1931 to become director of the Federal Employment Stabilization Board. He was appointed Temporary Administrator of Public Works by President Roosevelt to administer the construction section of the NRA legislation.

Colonel Sawyer has always been active in technical affairs and was a Director of the Society from 1926 to 1928. In Washington he is a member of many committees and boards, some of which are connected with the Government.

HERMAN STABLER

BORN at Brighton, Md., on February 3, 1879, Herman Stabler was educated at Earlham College, Richmond, Ind., and Columbian (now George Washington) University in Washington, D.C., receiving the degree of B.S. from the former. His active professional work was performed almost wholly in the Department of the Interior from 1903 to 1922, when he was engaged in investigation and research work in the field of hydraulic and sanitary engineering for the U. S. Geological Survey and the U. S. Reclamation Service. Since 1922 his work has been largely administrative: as chief of the Land Classification Branch of the U. S. Geological Survey and, since 1925, as chief of the Conservation Branch of the Survey, engineering and technical organizations dealing with classification as to mineral, water, and agricultural resources and supervision of power projects and mineral development operations on the public domain. In this capacity he has directed a stock taking of the natural resources of the Western States and planned surveys of thousands of miles of Western rivers as a basis for general development programs. In 1923 he participated actively in an exploratory topographic, geologic, and hydraulic survey of the Grand Canyon of the Colorado by boat to complete the final major river survey in the basin of the Colorado.

His published works include numerous Government and state documents and contributions to the current literature on the subjects of pollution of streams, disposal of manufacturing wastes, composition of waters, development of water supplies, rate of erosion, silt accumulation, industrial uses of water, oil field waters, water power, the public domain, and other topics.

EIGHTY-SECOND ANNUAL MEETING, January 16–19, 1935, in New York, N.Y., at Society Headquarters

He has affiliated with local engineering societies at his place of residence and has been a member of the American Institute of Mining and Metallurgical Engineers since 1927. He is now a director of a local section of this institute.

Obtaining Reprints of Articles

TO FACILITATE the obtaining of reprints of articles published in CIVIL ENGINEERING, the Society regularly has 100 printed copies made of each main article before the type is destroyed. Of these the authors are sent 25 copies with the compliments of the Society as a token of appreciation. The remainder are kept on file at Headquarters for sale at the nominal price of 15 cents each.

Frequently reprints in quantity are needed by individuals or organizations to serve some special purpose. In this case orders should reach the editorial office at Society Headquarters by the tenth of the month of publication. After that date the type will be destroyed. Reprints are furnished at cost, the price depending on the quantity ordered, in accordance with the accompanying schedule of rates.

SCHEDULE OF RATES FOR REPRINTS

No. of Copies	1 PAGE	2 PAGES	4 PAGES	8 PAGES
100 or less	$5.25	$6.50	$7.75	$11.00
200	6.00	7.25	8.50	12.00
500	8.00	9.00	10.50	16.25
1,000	10.25	11.50	13.75	22.00
1,000 additional	4.75	4.75	6.75	12.50

It should be noted that three- and four-page articles require a four-page reprint, and that five-page articles require an eight-page reprint. Reprints may be ordered with a titled cover of the same paper as that on which the rest of the article is printed, at a small extra charge for setting the title itself. An estimate of this extra amount will be furnished on request.

Complimentary copies of reprints are forwarded from the plant of the printer, the Mack Printing Company, at Easton, Pa., about the fifteenth of the month of issue. Beginning January 1, 1935, all but these complimentary copies will be sent, express collect, by the Railway Express Agency, Inc. This change in shipping procedure has been adopted to save expensive bookkeeping, billing, and recording and to simplify the shipping process. The express charges, to be paid collect, are normally small, being based on a rate of $1\frac{1}{2}$ cents per lb with a minumum of 10 cents on any one shipment. This charge has not been included in the schedule of rates shown. As has been the practice hitherto, even this slight charge will be prepaid on the complimentary copies of reprints that are sent to the authors.

Membership Applications Omitted from "Proceedings"

THE December issue of PROCEEDINGS will omit one of the departments that has appeared regularly in that publication for many years, namely, the list of applications for admission to, and transfer in, the Society. The list will be moved but not abolished. It will appear in the January 1935 issue of CIVIL ENGINEERING instead of in the December issue of PROCEEDINGS.

This change has been under consideration for some time but has only recently been adopted by the Committee on Publications. It is intended to benefit both publications and to add to the utility and value of the information. A more extended note of the change will accompany the publication of the list, under the new plan, in the January 1935 number of CIVIL ENGINEERING.

Local Membership Committees

SINCE 1923 there have been quietly at work within the Society a number of groups of Members known as Local Membership Committees. These committees, which are advisory to the Board of Direction, devote a great deal of time and earnest consideration to the search for unbiased information about applicants for admission to, or transfer in, the Society. Initiated in answer to a feeling that some sources of personal data were not being fully investigated, the committees have now created such a substantial place for themselves in the process of membership elections that the Board has come to rely heavily on their recommendations. A brief description of these committees and their operations will perhaps be of interest to the Members of the Society.

When an application for membership is received, the Society can turn to a number of accustomed sources of information concerning the applicant. He has been required to furnish the names of employers or other persons who have been connected with his professional engagements but who are not necessarily Members of the Society. He has been required to furnish the names of a number of Corporate Members of the Society who have personal knowledge of his work and who therefore may be in a position to evaluate those experiences in the light of Society requirements.

While these individual references are being asked for their personal opinions, the Board of Direction takes a preliminary ballot of its Members by mail, in which the individual opinions are based on the applicant's own statement, unsupported by information from employers or Member references. The preliminary classification required by this trial ballot demands many hours of detailed study by the Board members, but has been found indispensable in producing a uniform interpretation of Membership requirements. Employer references, Member references, and the Board all base their recommendations on the published professional record of the applicant.

Supplementing the technical and professional record are other elements of a man's career, which often exert a profound influence on his professional work. For example, a man of recognized technical ability might still not command the respect of his fellows because of personal traits of character. He may have unstable or even downright mean characteristics which should be made known to the Society before a decision can be made as to election. Sometimes events out of the past may be unknown to Member references or to such employer references as have replied to requests for information. The applicant's contemporary associates may be prevailed upon to give a straightforward appraisal of his character, which could not be obtained by any other existing agency of the Society.

Here are proper fields for investigation by the Local Membership Committees, and the resulting data frequently directs searching scrutiny to an otherwise colorless case. Needless to say, every bit of information so obtained is strictly confidential and is jealously guarded.

At present there are 70 Local Membership Committees. They consist of from three to six Corporate Members of the Society, generally affiliated with a neighboring Local Section. This is not a requirement, however, since a number of effective committees exist in areas where no Local Section has yet been formed. The committees are appointed by the Board of Direction upon recommendation of the Director through whom they are to report. The Director in turn usually seeks the recommendations of the Local Section and, if agreeable to him, then passes the nominations up to the Board for appointment.

The Director is the logical link with the Board of Direction, since it is to him that the Board looks for advice on all matters originating in his District. On the other hand, the Local Sections and individual members within that District look to their Directors as in any democratic form of organization. In fact, the investigation of every application from that District is carried on through the Director, with the help of the Local Membership Committee.

A very considerable number of Members of the Society, probably more than 400, during the past eleven years have given a great deal of time and conscientious effort to this business of being additional eyes for the Board. They are selected with great care. Their recommendations are seldom overridden except for unusual reasons. Obviously they receive very little publicity or glory for the accomplishment of investigations that are often difficult and sometimes embarrassing. That their work is of vital importance may be inferred from the surprisingly uniform interpretations of membership requirements throughout the country, which can only have been attained by the earnest efforts and sincere determination of these members.

Their unselfish labors are contributing greatly to the present maintenance on a high plane of the standards of the Society.

Preview of Proceedings

The December issue of PROCEEDINGS *should delight the engineer specializing in structural design. Two papers in this field are definitely scheduled for appearance in this number, and there may be a third. One of these papers deals with a new and simple method of designing multiple arches on elastic piers; another is on the design of steel columns. The third, which will be published if space permits, is on a modification of the Cross method of distributing fixed-end moments.*

ANALYSIS OF MULTIPLE ARCHES

A CONTINUOUS system of arches on elastic piers is analyzed by Alexander Hrennikoff in his paper, "Analysis of Multiple Arches," and a method of finding moments and horizontal thrusts at the ends of individual arch spans and piers is presented. The system is evolved from the analysis of continuous frames by distributing fixed-end moments, which Hardy Cross, M. Am. Soc. C.E., published in the May 1930 issue of PROCEEDINGS. The author advances some ideas concerning a novel variation of that method as applied to multiple arches.

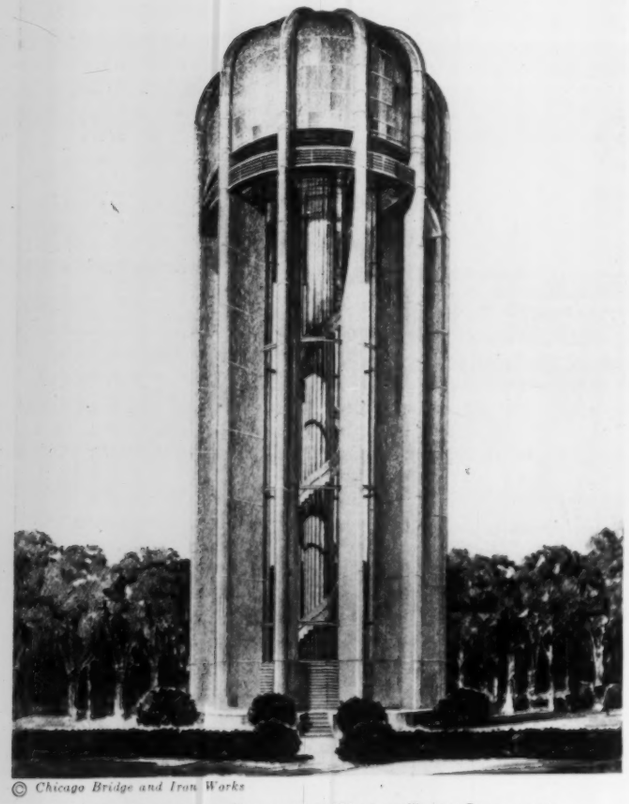
Simply stated, the proposed method may be divided into three major steps as follows: (1) analyze the individual spans on the assumption that they are fixed, and on this assumption determine the end moments and thrust for each arch; (2) find the unbalanced moment and thrust at each pierhead by adding, algebraically, the fixed moments and thrusts coming from two adjacent arch spans; and (3) determine a series of quantities that may appropriately be termed "end distribution" factors. With certain essential differences, these factors are similar to the distribution factors and the carry-over factors in the Cross method of moment distribution.

Two examples are worked out in detail, and the manner in which the computations are tabulated is illustrated by tables. For his method Mr. Hrennikoff claims: (1) that it does not involve mathematics more complicated than elementary algebra; (2) that the various steps in the solution are quite easy to visualize; and (3) that the possibility of incorporating errors in the work is at a minimum due to the number of checks possible.

RATIONAL DESIGN OF STEEL COLUMNS

Calling attention to the present-day practice of designing columns by empirical formulas, a paper in the forthcoming issue of PROCEEDINGS entitled "Rational Design of Steel Columns" by D. H. Young, Jun. Am. Soc. C.E., shows the inherent difficulty of reconciling pure theoretical effect with the actual behavior of a column under load. In the latter case, slight imperfections may have a decided effect under the following conditions: if the material happens not to be perfectly elastic; if the column itself, in its initial position, is not ideally straight and has some degree of crookedness, however slight; if there is some accidental eccentricity in applying an axial load; and if the conditions of fixity at the end of the column are uncertain.

In this paper, Mr. Young has aimed to present a general theoretical basis for design, which will take into account all the necessary factors. He shows how the aforementioned accidental factors affect the strength of the column and how a knowledge of these factors enables a designer to incorporate some saving in material. The paper is in two parts, dealing with columns of solid cross-sections and with built-up steel columns, respectively. Mr. Young recommended that, as a basis of calculation, some imperfection in the form of an initial curvature or an eccentricity of load be assumed, and then that the working load be selected on a basis of the load that first produces a yielding in the extreme fiber due to the assumed form of imperfection. A set of curves is recommended for the application of this method, and illustrated examples of such curves are included in the paper.



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APPEARANCE OF ELEVATED WATER TANK IMPROVED
From a Prize Design by Eugene Voita, 1931

A SECTION OF PHILADELPHIA'S OLDEST CAST-IRON PIPE
Laid in 1817; in Good Condition in 1931

WATER SUPPLY ENGINEERING

A Progress Report of the Committee of the Sanitary Engineering Division

A committee of the Sanitary Engineering Division, on water-supply engineering, was appointed to keep the Division advised of the progress of water-supply engineering during the year. This committee has been much more active than the sum total of its published material would indicate. A brief abstract of its report for 1934 was published in the March 1934 issue of CIVIL ENGINEERING. The forthcoming treatment in PROCEEDINGS is in the form of a consolidated statement of work done since early in 1932.

The first part of the report is a detailed description of the activities of all organizations interested in water-supply engineering. As an instrument for preventing duplication of work, this report should prove invaluable. The aim throughout has been not only to record the important contributions of the various agencies interested in the subject, but also to report any omissions that seem to be of consequence. Letters were addressed to the secretaries of each organization. Private individuals, Members, and non-members of the Society were consulted freely, and information was secured from numerous other sources. All of this material was then collated and condensed so as to emphasize the items of greatest importance.

The report cites the activities of about 17 societies in addition to our own, which are actual or potential contributors to research in the field of water-supply engineering. The conclusion is advanced that the Society has been rather slow in taking the lead in such hydraulic research as would provide water-supply engineers and hydrologists with reliable constants and standards for practical use. The following subjects for new research are recommended: (1) increased losses of head in pipes with various kinds of coating as affected by age and kind of water; (2) losses of head in fittings, valves, check valves, and transition of various common kinds; (3) effects of piers and changes of section on flow in streams; (4) water hammer; (5) special methods of measuring water; and (6) laws of scale relationship of hydraulic models.

In the second part of the report is recorded the present status of the science of water-supply engineering.

DIRECT METHOD OF DISTRIBUTING FIXED-END MOMENTS

A very interesting offshoot of the Hardy Cross method of distributing fixed-end moments is presented in a paper entitled "Direct Method of Distributing Fixed-End Moments," by T. Y. Lin, Jun. Am. Soc. C.E. If space permits, this paper is to appear in the December issue, and with this possibility in mind a review of its principal characteristics appears here. It should be stated that Mr. Lin's paper was submitted to the Society on March 15, 1933, but that it was then thought that this general subject would profit by a suspension of discussion long enough to permit practicing engineers to assimilate the fundamental principles already expounded in PROCEEDINGS. It is considered that the time is now ripe for such renewed discussion, and the reaction to Mr. Lin's suggestions for modifying the Cross method will be watched with interest. The paper is written and greatly abstracted from Mr. Lin's thesis submitted to the University of California, as a requirement for the degree of master of science in civil engineering.

In Mr. Lin's paper the original moment-distribution method is modified so that it can be applied to such problems as that of side sway, without a series of approximations. The application of the method requires practically no mathematics; consequently it is easy to understand. It is not claimed that Mr. Lin's paper will replace the Cross method, but that it supplies a convenient alternate method which has advantages in certain cases that will be recognized by an experienced designer.

Volume 97 of "Transactions" in Demand

THERE seems to be some special popularity attached to Volume 97 of TRANSACTIONS, comprising papers on the George Washington Bridge, which was issued a year ago. At that time the edition was fixed, it was thought, so that ample copies would be available for future needs. Such has not proved to be the case.

For some time the Society has been unable to supply legitimate requests for this volume. Many of these come from Members who were not eligible to receive it a year ago. In numerous instances, also, Members desire this volume in order to complete a series of Society TRANSACTIONS.

It may be that some Members who have received Volume 97 in paper covers are not intending to keep theirs for permanent use. If they would care to relinquish such volumes, they are asked to return them to Headquarters. The Society will be glad to refund transportation charges.

A Manual on City Surveying

THE LAST of three manuals to be published in 1934 has been entitled, "Technical Procedure for City Surveys." Despite this rather restricted title, the manual is so comprehensive in scope that it would seem to contain some essential element of value to almost every member of the Society, whatever his specialty. The major headings are: triangulation, first and second-order traverse, first and second-order levels, topographic surveys, and property surveys. But the members of the Surveying and Mapping Division have succeeded in arranging in convenient form for reference an imposing list of classifications for procedure and standards of accuracy, as well as equipment, methods of computation, and mapping, which have never before been collected in form so convenient for the use of the practicing engineer. Essential tables are given as well as cross-references to other tables and classic reports. Particularly, Government reports are included in liberal numbers.

This manual, of the ten that the Society has produced to date, is the most ambitious in scope. It is expected that it will find an important place in the engineer's library. Because of its wide appeal, Manual 10 will be forwarded to all Society members.

Index to Volume 4 of "Civil Engineering" Ready

WITH the December number of CIVIL ENGINEERING, Volume 4 comes to a close. For the advantage of those who wish to bind their copies immediately a complete index to Volume 4 has been prepared and is included at the end of this issue. In spite of the extra effort required to make up a volume index concurrently with the final number to be indexed, it is believed that the added convenience to readers makes it desirable to continue the practice of previous years of binding the index for the year in the final number of the volume.

As an additional convenience, the index is printed on a separate and complete form and is stapled in immediately after the last pages of advertising in this issue. Thus by opening the staple fasteners, the index may be lifted out complete for inclusion at the beginning of the bound volume. With its title page it then forms a suitable frontispiece for the volume.

The index, in so far as is possible, has been made complete and of the greatest practical usefulness. An article may be found either in the part devoted to subjects or in that devoted to authors. Many cross-references are included in the subject index.

Throughout the volume advertising pages have been numbered independently so that if covers and advertisements are removed before the volume is bound the paging of the articles and departments will be consecutive from month to month. Extra copies of the index may be obtained on request at Society Headquarters at a price of 15 cents each.

Revisions for 1935 Year Book

CHANGES of address or title of Members can be made for the 1935 edition of the *Year Book* if they are submitted to Headquarters. Many members make it a point to keep the Society informed currently of every change, which means that the office records with respect to them are always correct. To that extent the *Year Book*, when it is issued under date of March 1, is also correct as of that date.

It is sometimes remarked that the list of Members suffers in usefulness because of changes that occur even while the book is in process of printing and distribution. This is unavoidably true as regards a small number of names. During the year the unpublished changes of address increase in considerable quantity; hence the value of an annual up-to-the-minute compilation in the *Year Book*.

This year the Society will return to its former policy of sending out postal cards to obtain data for the forthcoming *Year Book*. Members are urged to fill out these cards and return them as promptly as possible, so that the 1935 *Year Book* will be truly representative of the membership of the Society. It is particularly important that corrections be returned before February 1, 1935, or at the latest before February 15.

News of Local Sections

CINCINNATI SECTION

A meeting of the Cincinnati Section was held on October 8 at the Engineers Club. When the business of the day had been disposed of, the chairman presented Charles P. Taft, chairman of the Governor's Commission on County Government, who gave a very interesting discussion on the county home rule movement, with particular reference to county government in the state of Ohio. There were 20 members and visitors in attendance.

COLORADO SECTION

On October 15 the Colorado Section held a meeting at the Olin Hotel in Denver. The dinner was attended by 67 members, and about 20 came in afterwards for the meeting. E. B. Black, Director of the Society, addressed the session on the subject of current Society finances and other matters of importance.

DAYTON SECTION

The Dayton Section held a luncheon meeting at the Engineers Club on October 15. The 16 members present heard a stimulating talk on relief work given by Mark Eshbaugh, Director of Relief of the Montgomery County (Ohio) Relief Association.

DETROIT SECTION

The annual election of officers of the Detroit Section, which took place at the meeting held on October 12, resulted as follows: R. H. Sherlock, president; Martin R. Fisher, first vice-president; W. C. Hirn, second vice-president; and C. O. Wisler, secretary-treasurer. The business session was followed by an address by Prof. Henry E. Riggs, Director of the Society, who gave an account of the Vancouver Convention and a description of Boulder Dam.

ITHACA SECTION

At the annual meting of the Ithaca Section officers for the coming year were elected as follows: Fred Asa Barnes, President; H. E. Snyder, first vice-president; and C. A. Harrell, second vice-president. John E. Perry will continue as secretary-treasurer.

KANSAS CITY SECTION

The Kansas City Section held a dinner and meeting on November 1, at which Roy C. Johnson, Engineer of Grade Separations, Missouri State Highway Department, spoke on grade-separation work. Mr. Johnson showed illustrations of a number of structures, and his paper elicited considerable discussion. Then E. B. Black, director of the Society, spoke on Society affairs of current interest and importance.

KANSAS STATE SECTION

On October 20 the Kansas State Section held a meeting at Manhattan, Kans. The guest of honor was E. B. Black, Director of the Society, who talked on the recent activities of the Board of Directors. The meeting was attended by 39 members and visitors.

METROPOLITAN SECTION

The regular monthly meeting of the Metropolitan Section, held in the Engineering Societies Auditorium on November 21, was devoted to the topic, "The Engineer in Latin America." Drawing from his long years of experience in the tropics, Fred Lavis, consulting engineer of New York, N.Y., discussed many interesting phases of the engineer's work and play, emphasizing railroad location and banana culture. He stressed his belief that far better opportunities for engineering development exist in the United States than in the tropics. This talk was supplemented by lantern slides and by three reels of moving pictures. A brief discussion followed, and then refreshments were served. The attendance was about 275.

MID-SOUTH AND TENNESSEE VALLEY SECTIONS

On November 8, 9, and 10, the Tennessee Valley and Mid-South Sections of the Society held a joint meeting in Knoxville, Tenn. All the Local Sections in adjoining states were invited to participate or send representatives to the meeting, with the result that guests were present from 18 different states, seven Local Sections, and three Student Chapters. On the first evening of the three-day meeting Dr. Arthur E. Morgan, chairman of the Tennessee Valley Authority, addressed a group of approximately 300 on "The Tennessee Valley Authority and Its Program." Friday morning James P. Growdon, of the Aluminum Company of America, spoke before the first of the technical sessions on the subject, "Hydraulic Developments of the Aluminum Company of America on the Little Tennessee River." Following this, Mr. David E. Lilienthal, Power Director of the Tennessee Valley Authority, explained the power program of the Authority. After Mr. Lilienthal's address, the entire group went by motor over the new freeway constructed by the Tennessee Valley Authority to Norris, Tenn., model city

GROUP FROM TENNESSEE VALLEY AND MID-SOUTH SECTIONS INSPECT NORRIS DAM

constructed by the Authority, where luncheon was served and a brief description of the town of Norris was given by James Bradner, Jr., town manager. Others who spoke were Ross White, construction superintendent on Norris Dam, and Barton M. Jones, construction engineer on the same work. The entire project was then thrown open to inspection, and a working model of the dam in operation on the mountain at the west abutment of the dam was observed.

In the evening a banquet was held, after which brief talks were given by Vice-President Jonah and Secretary Seabury, who discussed the work of the Society. Then came the speaker of the evening Maj. Brehon B. Somervell, whose subject was his recent experiences in making an economic survey of Turkey. Saturday was given over entirely to inspection trips, which included the hydraulic developments of the Aluminum Company of America on the Little Tennessee River, the large mills of the Company, located at Alcoa, Tenn., and the Great Smoky Mountains National Park.

Officers elected by the Tennessee Valley Section for the coming year are as follows: James G. Allen, president; E. D. Burchard, vice-president of the Asheville subsection; N. W. Dougherty, vice-president of the Knoxville subsection; A. F. Porzelius, vice-president of the Chattanooga subsection; John L. Neely, Jr., vice-president of the Florence, Ala., subsection; and H. H. Hale, secretary-treasurer.

PHILADELPHIA SECTION

The Philadelphia Section held its first meeting of the season on October 22, with B. F. Hastings acting as chairman. The meeting was addressed by Perry A. Fellows, administrative assistant for the Federal Emergency Relief Administration; William H. Connell, executive director of the Regional Planning Federation; Walter L. Fitzgerald, manager of the Technical Service Committee; and Carlton S. Proctor, chairman of the Society's Committee on Codes. They spoke on various phases of relief administration and on the NRA codes as they apply to engineers. There were 85 members and guests present at the meeting, and 43 at the dinner preceding it.

PORTLAND (ORE.) SECTION

A luncheon meeting of the Portland (Ore.) Section was held on October 25 in honor of the members of the consulting board for the Bonneville Project on the Columbia River, now under construction by the U. S. Engineers. These guests of honor—D. C. Henny, of Portland, L. F. Harza of Chicago, and L. C. Hill of Los Angeles—were introduced by C. I. Grimm, chief engineer of the project, and each spoke briefly concerning his work on the structure. Another member of this board, John P. Hogan of New York City, was unable to be present. There were 90 members and guests in attendance at the luncheon.

SAN DIEGO SECTION

The San Diego Section held a meeting on October 25 in the Churchill Hotel. A talk on county and state planning was given by Lorin W. Deewall, County Planning Engineer. This lecture was illustrated with charts and graphs showing conditions in San Diego County. A short discussion was also held on three city water projects to be voted on at the coming election, and Paul Beermann, senior draftsman for the City of San Diego, gave a brief description of each project.

SAN FRANCISCO SECTION

On October 16 the San Francisco Section held its 167th regular meeting at the Engineers Club. Dinner was served to 232 members and guests, and over 300 attended the technical session afterwards. Harrison P. Eddy, President of the Society, was present at the dinner and gave a short talk before he left to take a train East. The address of the evening, which was on the San Francisco–Oakland Bay Bridge, was given by C. E. Andrew, bridge engineer for the California State Department of Public Works, in place of C. H. Purcell, who was unable to attend the meeting.

ST. LOUIS SECTION

The St. Louis Section held a joint meeting with the St. Louis Engineers Club in the auditorium of the Engineers Club on October 11. An interesting talk on recent developments in the design and control of concrete mixtures was given by T. C. Powers, of the research laboratory of the Portland Cement Association. The joint attendance at the meeting was 137. On October 22 the Section held its 219th meeting, which was attended by 38 members and guests. A talk on the objectives of the United Relief Campaign was given, after which the feature speaker, Hugh Miller, State Engineer for the PWA, was heard. Colonel Miller gave an interesting talk on the achievements of the PWA and future work to be expected.

TEXAS SECTION

On October 26 and 27 the Texas Section held its regular fall meeting in Houston. During the business session the following officers were elected: John A. Focht, president; Walter H. Meier, first vice-president; W. W. McClendon, second vice-president; and J. T. L. McNew, secretary-treasurer. A number of discussions and technical papers were read at this two-day session, among them being "Texas Ports—the Gateway of the Southwest," by J. R. Wait, director of the Port of Houston, and "The Geology of the Gulf Coast Oil Fields," by Donald C. Barton. A paper on "Pitometer Waste-Water Survey of the Houston Water System" was presented by W. K. Van Zandt, and F. E. Geisecke chose as his subject, "A Study of Biological Treatment in Water of Settled Sewage." The topics, "Asphaltic Bases" and "Concrete Mixture Design," were discussed by R. M. Dunham and J. B. French, respectively.

Student Chapter News

UNIVERSITY OF NORTH DAKOTA

During the 1933–1934 school year the University of North Dakota Student Chapter won the cup at the annual engineers' day held by the university, for the best exhibit presented by the local student organizations. Several meetings, addressed by students and members of the faculty, were enjoyed during the year.

WASHINGTON UNIVERSITY (COLLIMATION CLUB)

Full enrolment of those eligible for membership was reported by the Washington University (Collimation Club) Student Chapter for the past school year. One of the major activities of the Chapter during the year was the preparation of exhibits for the annual engineers' day. The chief exhibit displayed by the Chapter was a working, 90-ft swing-span bridge. In addition to nine regular meetings held during the year, a smoker was enjoyed.

WEST VIRGINIA UNIVERSITY

Students figured prominently on the programs of meetings of the West Virginia University Student Chapter during the past school year. In all they presented 80 papers on topics of engineering importance, and their interest in engineering activities is further attested by the fact of 100 per cent enrolment in the Chapter. Good use was also made during the year of the illustrated lectures furnished by the Society.

WORCESTER POLYTECHNIC INSTITUTE

Several interesting meetings were held by the Worcester Polytechnic Institute Student Chapter during the school year, 1933–1934, the programs including talks by students, members of the faculty, and outside speakers. Among the latter were Arthur C. Eaton, Hydraulic Engineer for the New England Power Association, and Charles Hardy and Frank P. Broderick, respectively, Supervising Engineer and General Foreman of the Worcester Sewer Department.

YALE UNIVERSITY

The school year 1933–1934 was unusually successful for the Yale University Student Chapter. There was a 100 per cent enrolment of those eligible for membership, and the seven meetings held during the year attracted a total attendance of 490. One of the most enjoyable of these sessions was the dinner given for the Chapter by the Connecticut Section of the Society. The chief speaker on this occasion was Robert Ridgway, Past-President of the Society and Chief Engineer of the Board of Transportation of the City of New York. Other prominent speakers heard during the year included Joseph Andrews, an assistant engineer for the U. S. Coast and Geodetic Survey; Robert E. Doherty, dean of the Yale Engineering School; and E. G. Buckland, chairman of the New York, New Haven and Hartford Railroad.

ITEMS OF INTEREST

Engineering Events in Brief

Civil Engineering for January

AMONG THE articles in preparation for the January issue of CIVIL ENGINEERING are three which deal with as many phases of construction activity.

Across the Higuama River at San Pedro de Macoris in the Dominican Republic a modern suspension bridge, with a 554-ft central span, was completed in May 1934. Known as the Ramfis Bridge, it is on the main arterial highway of the republic and it is the second of its suspension bridges to be completed in 1934. The Ramfis Bridge was designed and fabricated in the United States, shipped 2,000 miles by boat, and erected complete in a period of five months. An article describing the construction of the anchorages, the erection of the towers, and the stringing of the two pre-stressed cables, has been written for the January number by W. A. Reeves, resident engineer on the work.

As the magnitude of engineering projects increases, the geologist's investigations of natural conditions become more and more important. The unprecedented size of certain recently constructed dams has brought into new prominence the long-standing partnership between engineer and geologist. In an article by Charles P. Berkey, M. Am. Soc. C.E., scheduled for this issue, the author explains the geological conditions deduced from studies of two great Government, water-storage and power projects: Boulder Dam on the Colorado River, which is being built by the U. S. Bureau of Reclamation, and Norris Dam on the Clinch River, now under construction by the Tennessee Valley Authority. Both of these important structures have had the benefit of a most careful geological scrutiny, which extended not only to the foundation of the dams but also to the reservoirs formed by them. Dr. Berkey's article is unusually interesting and informative.

One of the most common aids to excavation in wet ground is the steel sheet-pile cofferdam, built as a single wall, enclosing the site to be excavated. Such a cofferdam must be carefully designed. Bridge piers and sewer trenches are examples of single-wall cofferdams requiring internal bracing. In the January number Raymond P. Pennoyer, Assoc. M. Am. Soc. C.E., who has previously written for CIVIL ENGINEERING on the use of steel sheet-piling, will collaborate with George Hockensmith, vice-president of Booth and Flinn Company, contractors, in a readable and useful article on the theoretical and practical considerations required to produce a safe yet economical cofferdam.

Other articles, dealing with experimental hydraulics, harbor construction, and an engineering exploration, will be used as space permits. As usual, the January issue will contain a detailed program of the Annual Meeting to be held in New York, N.Y., January 16 to 19, 1935.

The Page of Special Interest

BROOKLYN Bridge is still thought by many engineers to be one of the most beautiful bridges in the world, and it has been the subject of the work of many artists. The etching on the "Page of Special Interest" in this issue is an unusually good treatment of this ever interesting subject. The original, which was picked up in an old etching shop in Budapest by Daniel E. Moran, M. Am. Soc. C.E., hangs in the New York office of his partner, Carlton S. Proctor, M. Am. Soc. C.E., where it is prized by its owner and admired by all who see it. But little is known of the artist, who signs himself simply, "Monk." The etching is undated, but from the construction equipment under the roadway and the horse-drawn vehicles in the foreground, it probably depicts the scene at about the time of the completion of the bridge in 1883.

Finding Work

RECOGNIZING the problem of reemployment which is today facing a large percentage of the engineering profession, the American Society of Mechanical Engineers is issuing in pamphlet form a reprint of an article entitled, "Finding Work." The original article appeared in *Mechanical Engineering* for November 1934. It was written by Samuel S. Board, placement specialist of New York City, and should be of interest to all engineers, both employed and unemployed.

The author begins by outlining the peculiarities of engineers' work and calling attention to the fact that they are frequently employed by the job. This makes it necessary for the engineer, even while working on one project, to be constantly looking ahead and preparing for the next. He emphasizes the necessity for keeping abreast of the latest technical developments, for maintaining an interest in the professional societies, and for being continually aware of the possibilities of advancement in the profession and of the trends that are affecting the individual's particular work.

In the course of this article, Mr. Board describes the various types of work open to engineers, ranging from the usual to the most uncommon. He sets forth a method for canvassing the field when in search of a job and brings out the point that work can often be found where at first glance it does not seem to exist, by "selling" to the employer the idea of the usefulness of an engineer in some particular capacity. Passing from the kind of work to the method of acquiring it, he goes on to show how the applicant should make a survey of his own abilities and experiences in order to widen the field of possible work, and gives instructions for preparing such information for presentation to a prospective employer. Here can be found definite help in planning a job campaign, both by letter and by personal interview, and an analysis of the right and wrong methods of handling such an interview.

The pamphlet is written in an easy, readable style, and many useful hints may be found in it by the engineer in search of work, or change of employment. Single copies can be obtained at the moderate price of 10 cents from the Publication Sales Department, American Society of Mechanical Engineers, 29 West 39th Street, New York, N.Y.

Reading for Pleasure and Profit

A suggested reading list appeared on page 331 of the June 1934 issue of CIVIL ENGINEERING *under the heading, "Reading for Self-Improvement of Young Engineers." This list was taken from the 1933 report of the Engineers' Council for Professional Development. In October 1934 this organization published a revised list under the title, "Reading Lists for Junior Engineers," which includes numerous additions to the 1933 list. These books comprise the following list, which is accompanied by the text of the report of the Council. Thus by referring to this list and to that published in the June issue the reader may obtain the complete bibliography of recommended reading.*

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Two of the most important attributes the successful engineer must possess are, first, the ability to deal with men and

EIGHTY-SECOND ANNUAL MEETING, January 16–19, 1935, in New York, N.Y., at Society Headquarters

affairs and, second, the ability to read and absorb the written experience of others. These abilities are seldom found fully developed in any man. Generally, they must be developed by the individual himself and usually after formal education is completed.

The reading list given here, based upon recommendations by a number of eminent men, many of them distinguished engineers, is presented especially for the junior engineer who is desirous of broadening himself and developing a full professional life. The titles are, we hope, suggestive and will attract the reader and lead him to explore farther. It is expected that these subjects will provide the basic framework on which the non-technical culture of the engineer will be built.

A few words of advice may be in order. Over a period of about four years a minimum of twenty-five of these books might be selected and read, with the limiting recommendation that the selection made will include at least one book in each classification. Read a few books well and make their thoughts your own, rather than skim many and absorb nothing. Develop reading habits outside of your technical specialty—it will profit you much in enjoyment and mental stimulation. Since "reading maketh a full man and writing an accurate one," practice the reduction of your thinking into written words so that you may perfect yourself in accuracy of expression.

NATURAL SCIENCE

BRAGG, WILLIAM. *Concerning the Nature of Things.* Harper, 1925.
A simple account, with many photographs, of the properties of atoms, and of the nature of gases, liquids, and crystals. Author is a pioneer in X-ray work.

DAMPIER-WETHAM, W. C. *History of Science and Its Relation to Philosophy and Religion.* Macmillan, 1929.
Evolution of scientific thought and research from the dawn of history in Babylonia and Egypt to the present.

DARWIN, CHARLES. *Origin of Species.* Appleton, 1900.
The preservation of favored races in the struggle for life. Contains additions and corrections from the sixth and last English edition.

EDDINGTON, A. S. *The Nature of the Physical World.* Macmillan, 1928.
Takes up both relativity and the quantum theory and traces the effect of modern concepts on free will and determinism.

MERRIAM, J. C. *The Living Past.* Scribner, 1930.
A study of evolution from plant and animal life as indicated in prehistoric remains found in various parts of the country.

RICKARD, T. A. *Man and Metals.* McGraw-Hill, Whittlesey House, 1932.
A history of mining in relation to the development of civilization from prehistoric times.

SHAPLEY, HARLOW. *Flights From Chaos.* McGraw-Hill, 1930.
Valuable whether the reader knows little or much about astronomy.

THOMSON, SIR J. A. *Modern Science.* Putnam, 1930.
The author discusses this question: Will the teachings of astronomy and science change our outlook on the universe as a whole, and the meaning of human life?

PHILOSOPHY AND RELIGION

BROWNE, LEWIS. *This Believing World.* Macmillan, 1930.
A fascinating account of the development of the chief modern religions.

CABOT, R. C. *Meaning of Right and Wrong.* Macmillan, 1933.
Discussion of the characteristics of right and wrong conduct as related to ordinary human experience, for people unfamiliar with philosophy.

DEWEY, JOHN. *Philosophy and Civilization.* Minton, 1931.
Might be described as "essays in experimental psychology."

ELLIS, HAVELOCK. *Dance of Life.* Houghton Mifflin, 1925.
Author's philosophy of life as an art.

HOCKING, W. E. *Types of Philosophy.* Scribner, 1929.
History of the leading types of philosophy, with thorough comparative analysis.

JASTROW, JOSEPH. *Effective Thinking.* Simon and Schuster, 1931.
An informal account of thinking. Part I deals with the technique of thinking; Part II with impediments to clear thinking; Part III with constructive phases by which right thinking is guided and encouraged.

KEYSER, C. J. *Humanism and Science.* Columbia University Press, 1931.
Evaluation of science and mathematics as agencies for realizing the ideals of humanism.

STEPHEN, KARIN. *Misuse of Mind.* Harcourt, Brace, 1922.
This book is likely to open one's mind to unexpected possibilities; an excellent introduction to the philosophy of Bergson.

THOMAS À KEMPIS. *Imitation of Christ.* Macmillan, 1924.
For five centuries the Christian manual.

ECONOMICS AND SOCIOLOGY

CHASE, STUART. *The Paradox of Plenty.*
A liberalist's view of our present economic situation.

COLE, G. D. H. *Guide Through World Chaos.* Knopf, 1932.
Survey of world crisis and its background of war conditions and in the light of capitalism of the past two centuries.

HUMPHREY, E. F. *Economic History of the United States.* Century, 1931.
Written for purpose of discovering conditions of today from a record of country's growth.

KELLER, A. G. *Man's Rough Road.* Yale University Press, 1932.
A study of age-old institutions—property, religion, and marriage, especially in primitive manifestations.

MARX, KARL. *Capital.* Kerr, 1919.
A critique of political economy. Written originally to make plain the fallacy of capitalistic economy.

MILL, J. S. *Principles of Political Economy, with Some of Their Applications to Social Philosophy.* Appleton, 1898.
Abridged edition, with critical, bibliographical, and explanatory notes, and a sketch of the history of political economy by J. L. Laughlin.

MILLS, F. C. *Economic Tendencies in the United States.* Little, Ives, 1932.
Statistical study of economic conditions from 1900 to 1929.

PATTERSON, S. H. *Readings in the History of Economic Thought.* McGraw-Hill, 1932.
Arranged by schools of thought from times of earliest expositions of economics down to neo-classicism. Stresses minor rather than major orthodoxies.

SMITH, ADAM. *Wealth of Nations.* Putnam, 1904.
Inquiries into the nature and cause of wealth of nations.

PSYCHOLOGY

ADAMS, SIR JOHN. *Everyman's Psychology.* Doubleday, 1929.
Recent psychological tendencies and schools are presented, questions of individual adjustment taken up, and studies of emotion and instinct as applied to individual development discussed.

EDMAN, IRWIN. *Human Traits and Their Social Significance.* Houghton Mifflin, 1920.
Introduction to contemporary civilization.

VITELES, MORRIS. *Industrial Psychology.* W. W. Norton, 1932.
An attempt to present a comprehensive picture of modern industrial psychology in its applications, principally in Germany, France, England, Italy, etc.

BUSINESS AND INDUSTRIAL MANAGEMENT

SCHELL, E. H. *Technique of Executive Control.* McGraw-Hill, 1930.
Straight thinking applied to the duties and difficulties of the executive.

TEAD, ORDWAY. *Human Nature and Management.* McGraw-Hill, 1929.
Book is addressed primarily to the factory manager.

LITERATURE, INCLUDING POETRY, ESSAYS, AND FICTION

The mark of an educated man is a general familiarity with great literature. The minimum for English-speaking people should be the Bible and Shakespeare. There are many other great writers and poets, and among them the young engineer will find a sympathetic spirit whose works will give him stimulus or repose as he wishes. Intimate acquaintance with a few of the world's great writers is to be desired and the following books are suggested as introductory only. A small library of great literature is a vital part of a busy man's relaxing equipment.

HOUSMAN, A. E. *Name and Nature of Poetry.* Macmillan, 1933.
A personal definition of its functions states that its aims must be to "transmit emotion—not to transmit thought." Nothing on modern poetry.

SHAKESPEARE, WILLIAM. *Plays and Sonnets.*

VAN DOREN, Mark, edited by. *American Poets.* Little, Brown, 1932.
Selections from fifty-seven poets from 1630 to 1930.

LAMB, CHARLES. *Essays of Elia.*

PATER, WALTER. *Marius the Epicurean.*

SHEPARD, ODELL, edited by. *Thoreau's Journals.*

DICKENS, CHARLES. *Tale of Two Cities.*

DOSTOYEVSKY, FYODOR. *Brothers Karamazov.*

FIELDING, HENRY. *The History of Tom Jones.*

GALSWORTHY, JOHN. *Forsyte Saga.*

HAMSUM, KNUT. *Growth of the Soil.*

HARDY, THOMAS. *Tess of the d'Urbervilles.*

STEVENSON, R. L. *Treasure Island.*

UNDSET, SIGRID. *Kristin Lavransdatter.*

HISTORY

BEARD, C. A., edited by. *Century of Progress.* Harper, 1933.
A summary of outstanding events of the last one hundred years in American history.

BREASTED, J. H. *Conquests of Civilization.* Harper, 1926.
A summary of human progress from the crude beginnings of civilization to the fall of Rome.

SULLIVAN, MARK. *Our Times.* Scribner, 1933.
History of America of the war years, with profusion of illustrations and quotations.

BIOGRAPHY AND TRAVEL

LENARD, PHILIPP. *Great Men of Science.* Macmillan, 1933.
Biographical sketches of about ten pages each, of more than fifty outstanding scientists from ancient times to the World War.

MACKENZIE, C. D. *Alexander Graham Bell.* Houghton Mifflin, 1928.

MEREZHKOVSKI, D. S. *Romance of Leonardo da Vinci.* Translated by Herbert Trench. Putnam.

STEFANSSON, VILHJALMUR. *Northward Course of Empire.* Macmillan, 1924.

FINE ARTS

BULLEY, M. H. *Simple Guide to Pictures and Painting.* Dutton, 1928.
Deals with principles of construction-design, personality, craft, tradition, and ways in which a painter works. Outlines the development of painting from Byzantine to modern French.

GARDNER, HELEN. *Art Through the Ages.* Harcourt, Brace, 1926.
World survey of history of art from earliest times to the present.

GENERAL

BACON, V. C. *Good English.* American Library Association, 1928.
Reading with a Purpose Series.

FOWLER, HENRY W. *Concise Oxford Dictionary of Current English.* Oxford University Press, 1926.
A large amount of information in very little space.

HOWELL, A. C. *Handbook of English in Engineering Usage.* Wiley, 1930.
Clearly written book for practicing engineers.

KILPATRICK, W. H., edited by. *The Educational Frontier.* Century, 1933.
A description of a definite program for remedying the confusion existing today in American education.

KILPATRICK, W. H. *Education and the Social Crisis.* Liveright, 1932.
A plea for a study of our "tragically inadequate" system of adult education.

MARTIN, EVERETT DEAN. *Civilizing Ourselves.* Norton, 1932.

SPENCER, HERBERT. *Education—Intellectual, Moral, and Physical.* Appleton, 1914.
Argument for rational scientific education of body, natural and reasonable moral training, and self activity and interest in intellectual training.

Distance Required to Overtake and Pass Cars

IN "Highway Research Abstracts" for October, issued by the Highway Research Board of the National Research Council, there appear the following comments by H. C. Dickinson, Chief of the Division of Heat and Power, U. S. Bureau of Standards, Washington, D.C.

How much clearance is needed for one car to overtake and pass another? Various figures, such as 500 and 1,000 ft, have occurred from time to time in traffic regulations, but apparently without any very good reason behind them. The typical case where risk is most generally involved seems to be that in which one driver is following another at a presumably safe distance, awaiting a clear space ahead long enough to permit safely overtaking the slower vehicle or line of vehicles.

Under these conditions the maneuver of overtaking and passing involves accelerating the rear car until it overtakes and clears the car ahead then returning to its own traffic lane. The ability of most cars to accelerate is approximately constant over the usual speed range from, say, 5 to 50 miles per hour. Therefore, the time required to overtake another car must be substantially constant and independent of initial speed. This was found to be the case in a series of tests made some time ago in which two cars, each with a driver and an observer, were taken out on an essentially level road for test purposes. The procedure was to drive the car ahead at constant speed and to overtake and pass it with the rear car, making observations with a stop watch of the time from the beginning of acceleration to the return of the car into its own traffic lane ahead. This was repeated alternately by each car at speeds all the way from 5 miles per hour to 45 miles per hour.

Another series of time measurements was made in which the car was accelerated from its rear position, and the watch started at the instant when the forward bumper of the car in the rear came in line with the rear of the car ahead. This appears to be the last instant in the maneuver which permits the rear driver safely to change his mind, in case of danger from an approaching car ahead.

In all these maneuvers the rear car, traveling at the same speed as the car ahead, started to accelerate from a position about $1^1/_2$ sec in time behind the car ahead.

The results of several hundred measurements may be of interest as they have a bearing on road design and safety. The time required to overtake and pass another car on a substantially level road, starting from a safe distance to the rear, is found to be very nearly 6 sec and independent of the speed. If time figures are reduced to distances, it is found that for a car to overtake and pass another traveling at 40 miles per hour on a road where speeds of 50 miles per hour may be expected, the driver intending to overtake must have at least 900 ft of clear road ahead if the maneuver is to be performed with safety.

In overtaking a slower moving vehicle, say, a truck traveling at 20 miles per hour, the safe distance is 650 ft, made up of 200 ft for the overtaking vehicles plus 450 ft for a vehicle approaching at 50 miles per hour. On the other hand, for maximum speeds above 50 miles per hour the safe distance is greater than 900 ft.

There are many parts of the United States where clear road stretches of more than 900 ft are rare. On such roads cars traveling at 40 or 50 miles per hour or above cannot overtake each other without grave risk. When cues of cars collect because of difficulties in this regard, the distance required and the dangers involved become much greater.

This illustrates one of the more obscure sources of danger that should be considered in road design. Clear vision of the road ahead should be provided in so far as this can be accomplished.

Research on Filler Material for Brick Pavements

IN DECEMBER 1933, the National Paving Brick Association established a Research Bureau at the Engineering Experiment Station of Ohio State University for the purpose of investigating the best utilization of vitrified brick in the design and construction of pavements. The research work has been principally in connection with joint fillers used in brick pavement construction with a view to developing a material that will be more non-exuding in character than the bituminous fillers now in general use.

Laboratory tests simulated service conditions with brick pavements having joints filled with various materials, constructed in panels and subjected to electrical heat on a definite schedule. According to the report of the National Paving Brick Association, the tests to date warrant the following conclusions: (1) The exuding of filler can be practically eliminated by the use of a blended asphalt with a high melting point. (2) A type of "plastic sulfur" also proved to be suitable. (3) By the addition of mineral matter to bituminous cement, exuding can be materially reduced.

NEWS OF ENGINEERS

From Correspondence and Society Files

RUSSELL WOODBURN, who was formerly with the Kentucky State Forest Service, has accepted a position as assistant engineer with the Soil Erosion Service, on the South Tyger River project in South Carolina. His headquarters are in Spartanburg, S.C.

PAUL BAUMANN has resigned as chief designer for Quinton, Code and Hill—Leeds and Barnard, of Los Angeles, Calif., to become assistant engineer in charge of the Mountain Division of the Los Angeles County Flood Control District, with offices in the same city.

LINCOLN B. GRAYSON is now supervisor of the Boston Plant of the Bethlehem Shipbuilding Corporation, Ltd., in East Boston, Mass. He was formerly a loftsman with the Fore River Shipbuilding Corporation, Ltd., in Quincy, Mass.

LOUIS E. RYDELL was recently appointed an assistant engineer in the Portland District Office of the U. S. Engineers, where he is doing flood-control investigation on the tributaries of the Lower Columbia River.

HERMAN A. BLAU has severed his engineering connection with the state of California and is now employed by the McClintic-Marshall Corporation in the capacity of civil engineer on the erection of the East Bay approach spans of the San Francisco–Oakland Bay Bridge. His headquarters are in San Francisco.

J. S. PARKER, JR., formerly engineer of design for the U. S. Public Health Service in Norfolk, Va., is now employed as an engineer by the firm of Fuller and McClintock in New York, N.Y.

ROGER D. BLACK is now senior construction engineer of the Housing Division of the Federal Emergency Administration of Public Works in Washington, D.C. Until recently he has been affiliated with the Board of Transportation on the construction of the Independent Subway System in New York City.

JOHN D. SPINKS is now in the U. S. Engineer Office, on the construction of Lock and Dam No. 3, at Fayetteville, N.C.

EUGENE KELLER, Jr., formerly regional manager of the Armco Culvert Manufacturers Association, of Middletown, Ohio, is now general manager of the Dixie Culvert and Pipe Company, in Memphis, Tenn.

H. R. TREVOR, who for the past six months has been inspector on the hydraulic dredge, "M. C. Harris," is now employed by the city of San Francisco, working on the sewage treatment plant.

BRUCE S. GENTRY has resigned as assistant engineer for the International Boundary Commission to accept the position of chief engineer for the contractors (the W. E. Callahan Construction Company and Gunther and Shirley) on the construction of the All-American Canal in California. His headquarters are in Yuma, Ariz.

P. W. HOLSTEIN, Jr., has been promoted from the grade of draftsman to that of senior assistant engineer with the Sewage Disposal Engineers, Division of Engineering and Construction, City of Columbus, Ohio.

MASON C. PRICHARD, formerly in the U. S. Engineer Office in Jacksonville, Fla., is now senior engineer in the office of the Chief of Engineers, U. S. Army, in Washington, D.C.

FRANCISCO GOMEZ-PÉREZ has severed his connection with the Mexican National Irrigation Commission, with offices in Mexico City, to accept a position in the Higher School of Building Construction of the Federal Department of Education of Mexico, where he will teach structural design. His headquarters are still Mexico City.

W. E. FOWLER, formerly vice-president of the Youngstown and Suburban Railway of Youngstown, Ohio, has now become president of the Pittsburgh, Lisbon, and Western Railroad Company of the same city.

MORRIS BROOKS has resigned as chief of the Bureau of Building Inspection of Philadelphia, Pa., to establish a consulting engineering practice at 238 Cherry Street in the same city.

FRANK B. CAMPBELL has resigned from his position as assistant engineer in charge of earth dam investigations for the U. S. Bureau of Reclamation in Denver, Colo., to accept a connection as engineer in charge of embankment control for the Platte Valley Public Power and Irrigation District in North Platte, Nebr.

WILLIAM C. HILL is now district soils engineer in District No. 4 of the Minnesota State Highway Department. His headquarters are in Morris, Minn.

DUFF A. ABRAMS has established a consulting engineering practice at 342 Madison Avenue, New York, N.Y. Until recently he was director of research for the International Cement Corporation of the same city.

WILBUR R. BARROWS is now employed by the Harza Engineering Company, Loup River Public Power District, Columbus, Nebr.

MILO S. KETCHUM, JR., is now employed as a junior engineer by the U. S. Reclamation Service in Denver, Colo.

RICHARD W. LAMBRECHT is now vice-president and engineer of the O. W. Burke Company, of Detroit, Mich.

ALLEN A. JONES, until recently with the firm of Fuller and McClintock, has accepted the position of engineer examiner for the PWA, with offices in Newark, N.J.

CHARLES A. ELLIS has been appointed Professor of Structural Engineering at Purdue University, LaFayette, Ind. For the past several years he has been engaged in general engineering practice.

E. WARREN RAEDER has joined the staff of the University of Colorado in the capacity of Associate Professor of Civil Engineering.

MAURICE C. LIPP has accepted an appointment as junior engineer with the U. S. Bureau of Reclamation, in Denver, Colo.

CHEO-CHUN WONG is now a member of the staff of the Division of Design, Department of Engineering, Ministry of Railways, Nanking, China.

CLIFTON E. HICKOK has recently taken the position of assistant state engineer for the PWA, in charge of projects in northern California, with headquarters in San Francisco. He was formerly city manager of Alameda, Calif.

GEORGE R. RICH has been transferred from the U. S. Engineer Office in Boston, Mass., to the same office in Kansas City, Mo., where he is serving as hydraulic engineer on the Fort Peck Project.

LAWRENCE V. SHERIDAN is now a consultant for the State Planning Board of Indiana, with headquarters in Indianapolis.

KARL R. KENNISON has been promoted from the position of designing engineer for the Metropolitan District Water Supply Commission of Boston, Mass., to that of assistant chief engineer in the same organization.

Changes in Membership Grades

Additions, Transfers, Reinstatements, Deaths, and Resignations

From October 10 to November 9, 1934, Inclusive

ADDITIONS TO MEMBERSHIP

AGNEW, JAMES CARSON (M. '34), Director, Winston Bros. Co., 920 Title Guarantee Bldg., Los Angeles, Calif.

ANNUCCI, JOHN (Jun. '34), 645 Elizabeth Ave., Elizabeth, N.J.

AUSTIN, VERLE LORRAINE (Assoc. M. '34), Asst. Engr., U. S. Geological Survey, Hammersmith Bldg., Temple, Tex.

BAILEY, LEONARD CASSELL (Jun. '34), Chf. Draftsman, City Engr.'s Office (Res., 2012 East 5th Ave.), Knoxville, Tenn.

BALBIANI, ANDREW STEPHEN (Jun. '34), 46 Macdougal St., New York, N.Y.

BAMPTON, NORMAN (Jun. '34), 23 Anstis St., Edgewood, R.I.

BOREL, PAUL ARNOLD (Jun. '34), 902 East Broadway, Toledo, Ohio.

BOUCHER, RAYMOND (Jun. '34), 1430 St. Denis, Montreal, Que., Canada.

BRADLEY, HARRY CALVERT (Jun. '34), Sea Bright, N.J.

BRASLOW, BARNETT (M. '34), Gen. Supt. of Constr., Civ. Works Administration (Res., 808 West End Ave.), New York, N.Y.

BRILL, HARRY VALENTINE, JR. (Jun. '34), 200 Atlantic Ave., Lynbrook, N.Y.

TOTAL MEMBERSHIP AS OF NOVEMBER 9, 1934	
Members	5,700
Associate Members	6,069
Corporate Members	11,769
Honorary Members	19
Juniors	2,914
Affiliates	100
Fellows	4
Total	14,806

BRUNK, GUY GEORGE (Jun. '34) 3420 Cottage Grove, Des Moines, Iowa.

BRUNNER, JOHN GRAYSON (Jun. '34), 1717 Lanier Pl., N.W., Washington, D.C.

BURY, CHARLES LINCOLN (Jun. '34), 2734 Indiana Ave., Kansas City, Mo.

BYRNE, RALPH EDWARD, JR. (Jun. '34), 803 South Oakland, Pasadena, Calif.

CAUGHRAN, GILBERT WOOD (Jun. '34), Chairman, State Highway Dept.; 609 South 4th St., Tacoma, Wash.

CHAI, HO-CHENG (Jun. '34), 2910 West St., Ames, Iowa.

COAKLEY, EDWARD ALBERT (Jun. '34), With North American Oil Refining Co.; 102 West 183d St., New York, N.Y.

COVOLO, ALBERT (Jun. '34), Computer, U. S. Coast and Geodetic Survey, 20 Nassau St., Princeton (Res., 722 Jackson St., West New York), N.J.

CULLUM, CARL C. (Assoc. M. '34), Care Tennessee Val. Authority, 451 New Sprankle Bldg. (Res., 1911 Laurel Ave.), Knoxville, Tenn.

CURTIS, GEORGE LEWIS (Jun. '34), 293 North Parkway, East Orange, N.J.

DALPHOND, ARTHUR (Jun. '34), 211 De Witt Ave., Belleville, N.J.

DEEMER, ARTHUR P., JR. (Jun. '34), Instrumentman, State Highway Dept.; 1515 Foliage St., Wilkinsburg, Pa.

DEICHLER, LUDLOW VANDERBURG CLARK (Jun. '34), Constr. Supt., Constr. and Equipment Dept., Montgomery Ward & Co., Chicago, Ill.

ENGLANDER, SAMUEL HILLIARD (Jun. '34), 18 Notre Dame St., Glens Falls, N.Y.

ERICHSEN, FRANK PETER (Jun. '34), Junior Engr., U. S. Bureau of Reclamation (Res., 1325 Marion St.), Denver, Colo.

FRIEDMAN, MARTIN EARL (Assoc. M. '34), Bridge and Civ. Engr., Cuyahoga County Bridge Dept., Cleveland (Res., 2247 Westminister Rd., Cleveland Heights), Ohio.

GANNETT, JOSEPH K. (M. '34), Vice-Pres. and Eastern Dist. Mgr., The Austin Co., 19 Rector St., Room 1500, New York, N.Y.

GILDEA, ALBERT PATRICK (Jun. '34), Gage Reader, U. S. Waterways Experiment Station (Res., 2602 Drummond St.), Vicksburg, Miss.

GODLEY, ASHTON LITTLE (Jun. '34), Wallingford, Pa.

GOLLUP, JOSEPH THEODORE (Jun. '34), 1555 Boston Rd., New York, N.Y.

GRAHAM, TOM SMITH (Jun. '34), Draftsman, State Highway Dept., Box 394, Silsbee, Tex.

GRIGGS, MILO (Jun. '34), With Consumers Power Co. (Res., 203 Williamson St.), Saginaw, Mich.

HACKNEY, JOHN WILLIAM (Jun. '34), 4921 Forbes St., Pittsburgh, Pa.

HAHN, ARTHUR ROBERT (Jun. '34), First Asst. to Borough Engr., Glen Ridge (Res., 343 Park Ave., Nutley), N.J.

HALBROOK, T. A. (Jun. '34), 420 South Chestnut St., Bristow, Okla.

HAMILTON, ROBERT FOSS (Assoc. M. '34), City Engr., Box 1415, Pocatello, Idaho.

HARPER, WALTER ALLEN (Jun. '34), 618 Connally St., Sulphur Springs, Tex.

HARVEY, THOMAS ASCOUGH (Jun. '34), 2118 North 7th St., Philadelphia, Pa.

HAZEN, RICHARD (Jun. '34), With West Virginia Pulp and Paper Co., New York (Res., Oliphant Ave., Dobbs Ferry), N.Y.

HICKS, JAMES ALLAN (Jun. '34), Chf. of Party with Dist. Engr., U. S. Engr. Office, Box 905, Charleston, S.C.

JOROFF, SAMUEL (Jun. '34), 1442 Fifty-first St., Brooklyn, N.Y.

KERN, ALBERT GEORGE, JR. (Jun. '34), Under Eng. Aide, Tennessee Val. Authority (Res., 1810 Melrose Pl.), Knoxville, Tenn.

KLATZKO, WILLIAM (Jun. '34), 2494 Kenmore Pl., Brooklyn, N.Y.

KOCH, JOHN POPE (Jun. '34), Clerk, Federal Emergency Administration of Public Works, Res., 3310 West Broadway), Louisville, Ky.

KOSH, DAVID (Jun. '34), With Tennessee Val. Authority (Res., 605 West Clinch Ave.), Knoxville, Tenn.

LENNEN, WILLIAM ELLIOTT (Jun. '34), Field Office Engr., Met. Water Dist. of Southern California, Berdoo Camp, Care Wide Camp, Indio, Calif.

LEY, ROGER DELMORE (Jun. '34), 288 Lefferts Ave., Brooklyn, N.Y.

LOWEY, LESLIE LAWRENCE (Jun. '34), Draftsman, Statistician and Account Executive, Market Research Corporation of America, New York (Res., 97-10 Twenty-fifth Ave., East Elmhurst), N.Y.

MCCLURE, FREDERICK FENTON (Jun. '34), 1315 Middle Ave., Elyria, Ohio.

MCFARLIN, JOHN FRANCIS (Affiliate '34), Owner, Southern Asphalt Const. Co., 1085 North West 56th St., Miami, Fla.

MCGRATH, THOMAS EDWARD JOSEPH (Jun. '34) 4436 Mitchell St., Philadelphia, Pa.

MCKNIGHT, JAMES WATSON (Jun. '34), Junior Constr. Insp., State Highway Dept., Dist. 11 (Res., 5470 Black St.), Pittsburgh, Pa.

MASON, JOHN RUSSELL (Assoc. M. '34), Engr., Northeastern Piping & Constr. Corporation, North Tonawanda, N.Y.

MORRIS, BROOKS THERON (Jun. '34), Junior Engr., U. S. Bureau of Reclamation (Res., 1624 Grant St.), Denver, Colo.

MURRAY, MATTHEW SWEETMAN (M. '34), Director of Public Works (Res., 5800 Wyandotte), Kansas City, Mo.

NAUMAN, ARTHUR CHARLES (Jun. '34), 2629 Greenleaf Ave., Chicago, Ill.

OWEN, PAUL HASKINS, JR. (Jun. '34), 2884 Woodbury Rd., Shaker Heights, Cleveland, Ohio.

PATTERSON, DONALD MACKELVY (Jun. '34), Junior Engr., Bureau of Eng., City of Elmira (Res., 369 West 4th St.), Elmira, N.Y.

PATTERSON, EVERETT GATES (Jun. '34), 34 Sutton St., Peabody, Mass.

PECK, RALPH BRAZELTON (Jun. '34), 1534 Tibbits Ave., Troy, N.Y.

PIERCE, ALTON LOUIS (Jun. '34), Draftsman, St. Louis County Highway Dept. (Res., 333 Kenilworth Ave.), Duluth, Minn.

POLLARD, EDWIN LEROY (Jun. '34), Junior Engr., Emergency Relief Administration (Res., 103 Massasoit St.), Northampton, Mass.

POTTER, SEYMOUR AUSTIN, JR. (Jun. '34), Rodman, M. of W. Dept., Erie R.R.; 120 Rutgers St., Belleville, N.J.

REXACH, FRANCISCO MANUEL (Jun. '34), Computer, Dept. of Commerce, U. S. Geodetic Survey (Res., 563 West 184th St.), New York, N.Y.

RIPKEN, JOHN FREDERICK (Jun. '34), 2627 Lincoln St., N.E. Minneapolis, Minn.

RIVES, ALVA GARD (Assoc. M. '34), Instrumentman., State Highway Dept., Box 67, Walnut Ridge, Ark.

ROSE, EUGENE LEONARD (Jun. '34), 455 Fairview Ave., West Warwick, R.I.

SALEMNICK, DAVID (Jun. '34), 857 Essex St., Brooklyn, N.Y.

SCHAFMAYER, ALBERT JAMES (M. '34), Engr., Board of Local Impvts., City of Chicago, 207 City Hall, Chicago, Ill.

SCOTT, WALTER MARVIN (Jun. '34), 145 South 3d Ave., Mount Vernon, N.Y.

SHEARER, HERBERT LEWIS (Assoc. M. '34), Chf. Engr., Central Rock Co., Inc. (Res., 314 McDowell Rd.), Lexington, Ky.

SHUGART, HAROLD EMERSON (Assoc. M. '34) (The Harold E. Shugart Co.), 7470 Santa Monica Boulevard, Los Angeles, Calif.

SPENCER, WALTER EARL (Jun. '34), Rodman, H. T. Evans, Spirit Lake, Idaho.

SPERO, MICHAEL ANTHONY (Jun. '34), 25 Hall Ave., Newport, R.I.

STOLLER, MANDELL DUDLEY (Jun. '34), 518 Ave. T, Brooklyn, N.Y.

TANDY, MILAM FLACK (Assoc. M. '34), Asst. to Chf. Engr., New-Kanawha Power Co., Box 222, Glen Ferris, W.Va.

THORSON, EDWARD WILLIAM (Jun. '34), 1400 Second Ave., S.E., Cedar Rapids, Iowa.

TURNEY, JOHN GARRETT (Assoc. M. '34), County Engr., Wharton County, Box 942, Wharton, Tex.

TURRENTINE, ROBERT EMMETT, JR. (Jun. '34), Contr., 4530 Bellaire Boulevard, Route 3, Box 83A, Houston, Tex.

TUTEWILER, HARVEY ALFORD (Assoc. M. '34), Pres., Gen. Mgr. and Owner, Ready Mixed Concrete Corporation & Standad Paving Co., 1236 Burdsal Parkway Boulevard, Indianapolis, Ind.

TUTTLE, LAUREN PRESTON Jun. '34), Route 2, Blairstown, N.J.

UITTI, WILLIAM LEOPOLD (Jun. '34), Camp Elmhurst, Elmhurst, Ill.

VIERTEL, GEORGE JOSEPH (Jun. '34), 11 Seaman Ave., New York, N.Y.

WAGNER, WARREN ORVAL (Jun. '34), North 3827 Atlantic St., Spokane, Wash.

WALDRON, HEBER GRAFENSTEIN (Jun. '34), Instrumentman, State Highway Dept., Valley City, N.Dak.

WALLACE, WAYNE PAUL (Jun. '34), 131 North Jefferson Davis Parkway, New Orleans, La.

WATKINS, ERNEST MONROE (Jun. '34), With J. E. Sirrine & Co., Box 1491, Greenville, S.C.

WENTWORTH, CHESTER KEELER (Affiliate '34), Associate Prof. of Geology, Washington Univ., St. Louis, Mo.

WIER, ROBERT JOHN (Jun. '34), 1019 West 38th St., Kansas City, Mo.

MEMBERSHIP TRANSFERS

ANDERSON, ANDREW MATTHEW (Jun. '27; Assoc. M. '34), Asst. Engr. (Structural Design), Westchester Park Comm., Bronxville (Res., 6020 Liebig Ave., New York), N.Y.

AUSTIN, WILLIAM MILNES (Assoc. M. '20; M. '34), Highway Engr., U. S. Bureau of Public Roads, Dept. of Agriculture, Luray, Va.

BAKER, ROLAND GAIL (Assoc. M. '25; M. '34), Asst. Chf. Engr. and Supt. of Irrig., Salt River Val. Water Users' Assoc. (Res., 65 West Virginia Ave.), Phoenix, Ariz.

BARNES, ROBERT LELAND (Assoc. M. '31; M. '34), Res. Engr., State Highway Comm., Box 491, Chalmette, La.

BEATTY, ROBERT (Jun. '24; Assoc. M. '34), 2308 East York St., Philadelphia, Pa.

BLACKBURN, DUNCAN ARNOLD MACVICAR (Jun. '28; Assoc. M. '34), Designer, Operation Div., Water Dept., City Hall (Res., 723 East Villa St.), Pasadena, Calif.

BLONDIN, JOHN RALPH (Jun. '28; Assoc. M., '34), Asst. Engr., Modjeski, Masters & Chase (Res., 7835 South Claiborne Ave.), New Orleans, La.

BRYANT, HARLAN MOORE (Assoc. M. '26; M. '34), Designing Engr., I. W. Jones & Co., Box 102, Milton, N.H.

DAWSON, LOUIS YOUNG, JR. (Assoc. M. '29; M. '34), Vice-Pres., Dawson Eng. Co., Inc. (Res. 13 Church St.), Charleston, S.C.

GRANOFF, DAVID (Jun. '27; Assoc. M. '34), Junior Civ. Engr., State Dept. of Public Works, Div. of Eng., Bridge Dept. (Res., 57 Pinewood Ave.), Albany, N.Y.

HALLSTROM, IRVING THORELL (Jun. '28; Assoc. M. '34), Secy., Hallstrom & Hallstrom, 949 Twentieth Ave. (Res., 763 Belmont Pl.), Seattle, Wash.

HEMPLE, HENRY WILLIAM (Assoc. M. '22; M. '34), Chf., Section of Civ. Works Surveys, U. S. Coast and Geodetic Survey, Washington, D.C.

HOPKINS, WILLIAM TRENHOLM (Jun. '17; Assoc. M. '21; M. '34), Chf. Draftsman, W. S. Lee Eng. Corporation, Power Bldg. (Res., 2227 Radcliffe Ave.), Charlotte, N.C.

KERR, SAMUEL LOGAN (Jun. '25, Assoc. M. '26; M. '34), Water Works Engr., Southwark Div., Baldwin-Southwark Corporation, Paschall Station P. O. (Res., 30 East Mt. Pleasant Ave., Mt. Airy), Philadelphia, Pa.

MCCROSKY, THEODORE TREMAIN (Jun. '24; Assoc. M. '34), Planning Director, City Planning Comm., City Hall (Res., 57 Beverly Rd.), Yonkers, N.Y.

NEFF, STEWART SMITH (Assoc. M. '22; M. '34), Structural Engr., Portland Cement Assoc. (Res., 19 Arlington Pl.), Buffalo, N.Y.

PITTARELLI, EMILIO (Assoc. M. '30; M. '34), 115 East 82d St., New York, N.Y.

POWERS, ELWOOD DENNIS (Assoc. M. '27; M. '34), Cons. Engr., Chamber of Commerce Bldg., Newark, N.J.

SCOTT, CLAUDIUS BERNARD (Jun. '26; Assoc. M. '34), Chf. Engr., Dave Steel Co., Box 450, Asheville, N.C.

SEAMAN, AYRES CROMWELL (Jun. '27; Assoc. M. '34), Draftsman, Am. Bridge Co., Ambridge (Res., 309 Chadwick St., Sewickley), Pa.

SHEPARD, RALPH NELSON (Assoc. M. '26; M. '34), Engr. of Constr. and Design, Carbide and Carbon Chemicals Corporation, 437 McCorkle Ave., South Charleston (Res., 3 Grosscup Drive, Charleston), W.Va.

SIMPSON, HAWLEY STARR (Jun. '26; Assoc. M. '28; M. '34) Research Engr., Am. Transit. Assoc., 292 Madison Ave., New York, N.Y.

SPELMAN, MALCOLM STEWART (Jun. '24; Assoc. M. '33), Asst. Engr., The Port of New York Authority, 111 Eighth Ave., New York (Res., 115 Raymond Ave., Rockville Centre), N.Y.

STONE, NELSON (Assoc. M. '22; M. '34), Dist. Mgr., Kalman Steel Corporation, Hamburg Turnpike at Ridge Rd., Lackawanna, N.Y.

STROMQUIST, WALTER GOTTFRID (Jun. '11; Assoc. M. '16; M. '34), San. Engr., Tennessee Val. Authority, New Sprankle Bldg., Knoxville, Tenn.

TAPLEY, GEORGE MANNING (Jun. '25; Assoc. M. '34), Care U. S. Engr. Office, Zanesville, Ohio.

THOMAS, CHARLES MITCHELL (Assoc. M. '22; M. '34), Hydrographic and Geodetic Engr., U. S. Coast and Geodetic Survey, Washington, D.C.

VANCE, ALEXANDER MILTON (Assoc. M. '06; M. '34), State Reclamation Engr., Austin, Tex.

WILLSON, CLARENCE ARDRY (Assoc. M. '26; M. '34), Structural Engr, State Archt's. Office (Res. 2314 Rowley Ave.), Madison, Wis.

WINKLER, EDWARD RUDOLPH, JR. (Jun. '24; Assoc. M. '27; M. '34), Rodman, P. R. R. (Res., 1746 East Oliver St.), Baltimore, Md.

REINSTATEMENTS

OVERSHINER, WILLIAM HUMPHREYS, Assoc. M., reinstated Oct. 17, 1934.

SABATELLI, EMIL ALBERT, Jun., reinstated Nov. 2, 1934.

RYAN, WILLIAM, Assoc. M., reinstated Oct. 9, 1934.

RESIGNATIONS

BATEMAN, JOHN HENRY, M., resigned Oct. 29, 1934.

BRUHN, ELMER FRANKLIN, Assoc. M., resigned Oct. 26, 1934.

GARDNER, WARREN, Assoc. M., resigned Oct. 18, 1934.

GORDON, JOHN GARDNER, JR., Assoc. M., resigned Oct. 23, 1934.

INABA, MINORU, Jun., resigned Oct. 17, 1934.

LEWIS, LAWRENCE BOSLER, Jun., resigned Oct. 18, 1934.

LOWE, THOMAS ALEXANDER, Assoc. M., resigned Oct. 26, 1934.

MCGAREY, THOMAS FRANCIS, JR., Assoc. M., resigned Oct. 26, 1934.

MERRIAM, JUDSON HUNTOON, M., resigned Nov. 1, 1934.

OAKLEY, JOHN WALTER, Assoc. M., resigned Nov. 7, 1934.

PLUMER, HAROLD EDWARD, M., resigned Oct. 31, 1934.

REILLY, THOMAS FRANK, JR., Assoc. M., resigned Oct. 29, 1934.

DEATHS

ADGATE, FREDERICK WHITNEY. Elected Assoc. M., Jan. 6, 1904; M., May 28, 1912; died Oct. 23, 1934.

BROWN, WILBUR GAYLE. Elected M., Feb. 24, 1931; died July 14, 1934.

BURD, EDWARD MORRIS. Elected Assoc. M., Oct. 10, 1916; M., May 12, 1930; died Nov. 5, 1934.

BUTLER, JOHN SOULE. Elected Assoc. M., March 4, 1908; M., April 2, 1913; died Oct. 19, 1934.

CARTER, HENRY HALL. Elected M., May 7, 1890; died Oct. 4, 1934.

CHURCH, FRED BUSH. Elected M., June 3, 1908; died Oct. 15, 1934.

CRAM, CLYDE MAXWELL. Elected M., Sept. 9, 1919; died Oct. 20, 1934.

GREISSER, VICTOR HUGO. Elected M., March 15, 1926; died Aug. 20, 1934.

GROVER, WILLIAM ALBERT. Elected Assoc. M., Sept. 12, 1916; M., Jan. 19, 1923; died Sept. 1, 1934.

HALL, JOHN WENDELL. Elected Assoc. M., Sept. 9, 1919; M., Oct. 12, 1925; died Nov. 1, 1934.

HALL, WILLIAM HAMMOND. Elected M., Jan. 2, 1884; date of death unknown.

HILL, JOHN EDWARD. Elected Assoc. M., May 4, 1892; M., March 31, 1908; died Nov. 2, 1934.

HOOPER, ELMER GUY. Elected Assoc. M., Nov. 21, 1921; M., July 5, 1933; died Oct. 24, 1934.

HOWE, GEORGE EDWARD. Elected Assoc. M., March 4, 1903; M., April 30, 1907; died Oct. 29, 1934.

JAMESON, JOHN ALEXANDER, JR. Elected Jun., Mar. 11, 1929; died Sept. 26, 1934.

MILLER, RICHARD LEVI. Elected M., March 13, 1917; died April 2, 1934.

NICHOLSON, MAURY. Elected M., Jan. 2, 1912; died Oct. 8, 1934.

O'SHAUGHNESSY, MICHAEL MAURICE. Elected M., June 4, 1902; died Oct. 12, 1934.

PETTERSEN, THOMAS. Elected M., March 16, 1925; died Oct. 12, 1934.

PIERCE, GEORGE ABLE. Elected Assoc. M., Jan. 5, 1909; died Sept. 12, 1934.

SCHOFIELD, HIRAM ABIF. Elected M., Oct. 7, 1896; died Oct. 18, 1934.

SMALL, KENNETH IRVING. Elected M., July 14, 1930; died Oct. 10, 1934.

SPRAGUE, FRANK JULIAN. Elected M., June 1, 1904; died Oct. 25, 1934.

WALDROP, JOHN DOUGLAS. Elected Assoc. M., April 25, 1921; M., Jan. 17, 1927; died Aug. 20, 1934.

Men Available

These items are from information furnished by the Engineering Societies Employment Service, with offices in Chicago, New York, and San Francisco. The Service is available to all members of the contributing societies. A complete statement of the procedure, the location of offices, and the fee is to be found on page 85 of the 1934 Year Book of the Society. To expedite publication, notices should be sent direct to the Employment Service, 31 West 39th Street, New York, N.Y. Employers should address replies to the key number, care of the New York Office, unless the word Chicago or San Francisco follows the key number, when the reply should be sent to the office designated.

CONSTRUCTION

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; 36; bachelor, master's and professional degrees, Purdue University. Experienced in concrete girder, arch, and steel bridges as: inspector, field and office engineer, draftsman, designer, field superintendent of erection; designer and detailer of concrete forms in panels, cofferdams, arch centering, falsework, erection equipment, plant layouts. D-864.

CONSTRUCTION ENGINEER; Assoc. M. Am. Soc. C.E.; 47; 27 years experience, field and office, on highway, railroad, transmission line and pipeline, location, and right-of-way work. Sewer construction, storm and sanitary, a specialty. Has own engineering equipment. Registered professional engineer, Pennsylvania. Location in United States immaterial. Available immediately. References furnished. D-3505.

CIVIL AND STRUCTURAL ENGINEER; Assoc. M. Am. Soc. C.E.; 31; married; registered civil engineer; experience in surveys, construction, and maintenance of fixed and movable bridges, highways, and sewers. Completely familiar with the construction of double-leaf bascule bridges. Location immaterial. Avail immediately. D-3353.

DESIGN

STRUCTURAL AND MUNICIPAL ENGINEER; Assoc. M. Am. Soc. C.E.; graduate C.E.; 15 years experience. Experienced designer, estimator, and superintendent, principally architectural engineering and sewage disposal. Competent to limited extent on mechanical installations, heating and refrigeration, pumps and conveying machinery. Also considerable experience in the design of heavy railroads, movable bridges, and cranes. Will go anywhere, including abroad. C-2701.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 30; B.S. in C.E.; 1 year field and office work on topography surveys; 4½ years varied structural experience on bridges, including investigations of stresses and capacities, and reinforcement of various types of highway and railroad bridges. References. Available immediately. D-2574.

SANITARY ENGINEER; Assoc. M. Am. Soc. C.E.; graduate C.E.; 12 years experience in the design and construction of sewers and sewage-treatment plants; at present in charge of a million-dollar sewerage project, financed with PWA funds. Will be available on short notice. C-874.

EXECUTIVE

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; graduate; 34; registered; 12 years experience in the design and construction of factory and office buildings, hospitals, oil-refining structures; railroad survey and construction; 5 years in South America. Writes and speaks Spanish, French, and German fluently. Conscientious and ambitious. Available on short notice. Location immaterial. D-3431.

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; long experience as chief of survey party, and a number of years in construction and valuation work, both field and office. Hydro-electric, railroad, and highway experience. Available immediately. C-8438.

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; college graduate; 38; married; specialized in reinforced concrete construction. For the past 9 years in charge of the design, estimate, detailing, and supervision of fireproof floor systems and all types of buildings. Desires permanent connection in Metropolitan New York or New Jersey. B-7608.

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; 20 years experience, drainage, highway, railroad, and contractor's engineer; estimating, bidding jobs, superintendent of construction; on dredging, earth moving, bridges, drainage structures, foundations, docks, and sewers. Familiar with floating equipment. Available on about two weeks notice. Southern States preferred. D-3490.

LICENSED STRUCTURAL ENGINEER; Assoc. M. Soc. C.E.; technical graduate; over 15 years experience on steel, concrete, and frame buildings, heavy foundations, and industrial planning. For 10 years engineer in charge with consulting engineer. Desires responsible position with engineer, architect, or contractor, in office or field. D-3299.

SANITARY ENGINEER; M. Am. Soc. C.E.; A.B. and C.E. degrees; 17 years experience in design, construction, and operation of water purification plants and sewage-treatment works. Good experience in swimming-pool sanitation. Detailed experience supplied upon request. Desires position with consulting engineer. D-3357.

GRADUATE CIVIL ENGINEER; M. Am. Soc. C.E.; graduate of Rensselaer Polytechnic Institute; experienced in designing, fabricating, and selling structural steel; desires position selling structural steel or machinery. Member national engineering societies; many acquaintances among contractors and engineers. Mid-Eastern or Southern territory preferred. Comprehensive knowledge of engineering, sales, and contracts. C-7790.

GRADUATE ENGINEER; Assoc. M. Am. Soc. C.E.; 36; married; 13 years varied experience, including sales, purchasing, and consulting. Available on short notice as sales engineer, consultant, or for position allied to engineering. D-5822.

CIVIL ENGINEER; M. Am. Soc. C.E.; 28 years experience, covering investigations and reports, laboratory testing of materials, organization, design, reinforced concrete construction. Specialist in checking coast erosion by sea defense works based on sound and proved principle. Speaks French, Spanish. Location immaterial. Available now. D-2989.

ENGINEERING EXECUTIVE; M. Am. Soc. C.E.; Pennsylvania license. Experienced administrator, general engineering and construction projects; foreign experience; consulting engineer; specialized in foundations, and port and terminal works. Interested in administration of engineering projects—from design to operation—also in making investigations, surveys, and reports, commercial and engineering projects, United States or foreign countries. D-3268.

ENGINEER-EXECUTIVE; M. Am. Soc. C.E.; registered professional engineer, Pennsylvania. Formerly connected with steel construction industry in engineering, operation, and sales; also in general contracting business. Invites opportunity to correspond in detail for a connection of any kind. C-5095.

ENGINEER EXECUTIVE; Assoc. M. Am. Soc C.E.; 42; married; graduate; registered professional engineer; construction and general manager; broad experience in charge of construction industry. Capable organizer, field work and office management; superintending, engineering, estimating purchasing, sales, costs, accounting, financing, and general business. Desires connection with industrial or utility corporation or construction company. C-1904.

JUNIOR

YOUNG ENGINEER; Jun. Am. Soc. C.E.; anything, anywhere, at any salary urgently desired; 25; college graduate with degrees of B.Sc. and C.E.; 1½ years surveying and drafting experience. Resident of New York City. Available immediately. D-3435.

YOUNG ENGINEERING GRADUATE; student member; Lafayette College, B.S. in C.E.; desires a position in any field of engineering or sales engineering. Competent surveyor, computer, draftsman, salesman. Location immaterial. Small initial salary desired. D-3450.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 23; single; Protestant; C.E. degree, Cornell University, 1933; knowledge of testing and sampling of highway materials; good draftsman; 4 months experience in general engineering practice in the field for large construction company. Desires permanent connection with any branch of civil engineering. Salary and location secondary. Available. D-3066.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; B.S. in C.E., Yale University; 1 year graduate study; 23, single; commission in Officers' Reserve Corps. Prepared for position in any branch of civil engineering, preferably work on bridges or dams. Wishes to gain experience. D-3502.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 23 single; B.S. in C.E., Rutgers University, 1933. Majored in structural design and hydraulics; 9 months, rod and chainman; 3 months, chief of topographical field party; resourceful and dependable. Desires engineering position where ability and willingness to work will count. Salary and location open. Available immediately. D-3316.

CIVIL ENGINEER; B.S. in C.E., University of Minnesota, 1933. High scholastic record; earned own education; drafting experience; accurate, adaptable, and some mechanical ability. No engineering experience; age 25; good health. Salary in proportion to responsibility of the work; available on two weeks notice. D-3327.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; graduate, 1927; married; 28. Varied experience, including surveys, design, and construction. Party chief on surveys; in charge of construction of highway bridges; 2 years, design work on large hydro-electric plant; structural steel fabrication. Available one months notice. D-3329

JUNIOR CIVIL ENGINEER; Jun. Am. Soc. C.E.; desires any engineering work; location immaterial; age 26; married, B.S. in C.E., Ohio Northern University, 1929; 3 months highway engineering; 5 years experience fabrication and tempering strong aluminum sheet and plate. D-3309.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 24; B.S. in C.E., Cooper Union; 4 years as structural draftsman and designer; 6 months as CWA assistant engineer in Drainage Department, Queensboro Hall. Desires engineering position requiring capability. Willing to work and learn. Location, New York City or vicinity. D-2730.

RECENT BOOKS

New books of interest to Civil Engineers, donated by the publishers to the Engineering Societies Library, or to the Society's Reading Room, will be found listed here. A comprehensive statement regarding the service which the Library makes available to members is to be found on page 75 of the Year Book for 1934. These notes regarding the books are taken from the books themselves, and this Society is not responsible for them.

BRIDGES. By Henry H. Bormann. New York, N.Y., The Macmillan Company, 1934. 79 pp., illus., 8 × 10 in., cloth, $2.

Unprofessional but sound and interesting book for the layman. Illustrated with a remarkable collection of photographs. Mr. Bormann, a teacher, has made this book graphic and one that will appeal to all ages.

HISTORY OF RENSSELAER POLYTECHNIC INSTITUTE, 1824–1934. By P. C. Ricketts. 3 ed. New York, John Wiley & Sons, 1934. 293 pp., illus., 9 × 6 in., cloth, $3.50.

President Ricketts began his association with Rensselaer Polytechnic Institute in 1871, when he entered it as a student, and has continued with it as professor and executive until today. He has seen it grow from an institution with 150 students to one ten times as large. This long personal acquaintance has enabled him to write an admirable account of the founding of the school and its development during its long life.

HÜTTE Des Ingenieurs Taschenbuch. 26 ed. Bd. 3, Lieferung 2. Edited by Akademischer Verein Hütte. Berlin, Wilhelm Ernst & Sohn, 1934. Pp. 677–1204, diagrs., charts, tables, 8 × 5 in., paper, 7 rm.

This publication completes the third volume of this well-known handbook and includes the sections devoted to road building, regional planning, bridge building, and railroads, together with fifteen appendixes of standards, specifications and tables, and an index to the whole volume.

HYDRAULICS. By E. W. Schoder and F. M. Dawson. 2 ed. New York and London, McGraw-Hill Book Company, 1934. 429 pp., illus., diagrs., charts, tables, 9 × 6 in., cloth, $3.50.

This is intended as a basic course in the hydraulics of engineering, which will serve both as an introduction to specialized studies and a text and reference book on everyday problems. The physical phenomena of hydraulics are described, particularly from the engineer's point of view; fundamentals are developed into useful formulas; and numerous examples of the analysis and solution of typical practical problems are given. The new edition has been enlarged and thoroughly revised.

OCEAN WAVES AND KINDRED GEOPHYSICAL PHENOMENA. By V. Cornish and additional notes by H. Jeffreys. Cambridge, Eng., University Press; New York, N.Y., The Macmillan Company, 1934. 164 pp., illus., tables, 9 × 6 in., cloth, $3.75.

The results of forty years of study of ocean waves and the kindred forms which wind and currents cause in sand and snow and in tidal bores. The work is illustrated by a number of interesting photographs.

STRUCTURAL DESIGN IN STEEL. By T. C. Shedd. New York, N.Y., John Wiley & Sons, 1934. 560 pp., illus., diagrs., charts, tables, 9 × 6 in., cloth, $5.

An account of the fundamental principles that underlie all design in structural steel, accompanied by illustrations of their application in practice. There are chapters on ordinary bridge and building frames, intended to show the ways in which fundamental structural forms are usually arranged and what functions they fulfill; the design of the three primary structural forms and their connections; the design of buildings and bridges; and structural welding. A feature of the book is twenty-four sets of design calculations.

STRUCTURAL FRAMEWORKS, A NEW METHOD OF ANALYSIS, WITH TABLES. By T. F. Hickerson. Chapel Hill, N.C., University of North Carolina Press, 1934. 147 pp., diagrs., charts, tables, 11 × 8 in., paper, $2.

The novel features claimed for the method are: advantageous definition for the stiffness of a member; introduction and evaluation of the so-called "degree of fixation" at the end of any member; a simple, exact formula for the "carry over" moment; the development of formulas for bending moments in a loaded member in terms of fixation factors; and the complete and final process of determining bending moments and then balancing and carrying them over in one cycle of operation. The method is applicable to members with both constant and variable moment of inertia.

TECHNIK GESCHICHTE. Beiträge zur Geschichte der Technik und Industrie, Band 23, 1934, Berlin, VDI-Verlag, 1934. 147 pp., illus. maps, diagrs., 12 × 9 in., cloth, 10.80 rm.

Discussion of the subject of roads from various aspects. The history of road building, ancient roads, MacAdam and his work, the history of North German highways, roads in medical history, and old streets and pavements in London are considered. Other contributors discuss the history of the wagonwheel, post roads, and post carriages, the history of the arch, primitive suspension bridges, the history of miiitary tanks, and African roads.

WARUM BAUEN WIR SO TEUER? By S. Heidinger. Edited by Österreichischen Kuratorium für Wirtschaftlichkeit. Vienna, Julius Springer, 1934. 217 pp., illus., diagrs., charts, tables, 8 × 6 in., paper, 7.40 rm.

As the first step toward the reduction of building costs in Austria, the National Rationalization Board had made a study of the causes of present high cost, which attempts to throw light on certain basic causes. The effect of legal regulations, such as working hours, workmen's insurance, etc., of wages and materials prices, the importance of good management, and similar matters are discussed in detail, and the part that each plays in costs is explained.

MEN AVAILABLE

These items are from information furnished by the Engineering Societies Employment Service, with offices in Chicago, New York, and San Francisco. The Service is available to all members of the contributing societies. A complete statement of the procedure, the location of offices, and the fee is to be found on page 97 of the 1933 Year Book of the Society. To expedite publication, notices should be sent direct to the Employment Service, 31 West 39th Street, New York, N.Y. Employers should address replies to the key number, care of the New York Office, unless the word Chicago or San Francisco follows the key number, when the reply should be sent to the office designated.

CONSTRUCTION

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 29; B.S. in C.E., New York University; 7 years experience with general contractors and engineers; estimating, design, drafting, surveying, and layout work; in responsible charge of construction in field. Available immediately. Location immaterial. D-2728.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 31; single; B.S. in C.E., University of Illinois; 1 year of construction surveying; 3 years as instrumentman and chief of party, land surveying; 3 years as instrumentman, railroad maintenance and grade separation construction. Desires position in any branch of civil engineering. Location immaterial. D-2704.

CONCRETE TECHNICIAN; Assoc. M. Am. Soc. C.E.; technical education; married; 8 years construction experience, specializing in concrete design, control, charge of inspection force and concrete testing laboratory. Qualified to take charge of concrete field laboratory, concrete inspection force, and of making special investigations in concrete and preparing reports. Location immaterial. Available one month's notice. C-8022.

ESTIMATOR AND CONSTRUCTION ENGINEER; Assoc. M. Am. Soc. C.E.; 39; married; graduate civil engineer; 18 years experience making up competitive bids on public and commercial projects; thoroughly familiar with prices and costs, all items, coordinating and expediting subcontracts, and supervising field operations. Desires position with builders or contracting engineers. Location immaterial. B-4964.

DESIGN

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 28; married; C.E. degree, Polytechnic Institute, Brooklyn; special course in structural engineering; 9½ years practical experience in design of structural steel for subways, piers, pier sheds, tunnels, buildings in railroad yards, and elevated structures. Checker of shop drawings; excellent draftsman. Available immediately. Location anywhere. D-1754.

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; 37; married; graduate; state licenses; 10 years experience, surveying, design, and construction. Railroad, highway, parkway, harbor, and tall building projects. Completely familiar with the design of rigid-frame bridges, reinforced concrete or steel, single or multiple span, square or skew. Available immediately. D-1496.

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; graduate C.E.; 19 years diversified experience with nationally known organizations. Experience includes survey work, design and details of structural steel and reinforced concrete, plant layout, machinery location and details, elevators, conveyors, transmissions, etc. Accurate, reliable. Available immediately. D-1028.

STRUCTURAL DESIGNER AND ESTIMATOR; Assoc. M. Am. Soc. C.E.; college graduate; civil engineer, licensed professional engineer, 38; married; 10 years European experience and 6½ years experience in New York City. Open for permanent connection. C-4607.

STRUCTURAL DESIGNER; Assoc. M. Am. Soc. C.E.; 31; married; license, New York State; graduate of Rensselaer Polytechnic Institute; 10 years intensive practice; 8 years with consulting engineer; design, specifications, estimates, reports, movable bridges, building; recently associated on design of large vertical lift bridge. Available on short notice. D-506.

CIVIL AND STRUCTURAL ENGINEER; Jun. Am. Soc. C.E.; 30; B.S. in C.E. and C.E. degrees; about 5 years experience in New York City as a designer, detailer, draftsman, checker, and estimator of steel and reinforced concrete. References and samples of work sent on request. C-6186.

EXECUTIVE

ENGINEER-ACCOUNTANT-LAW STUDENT; Jun. Am. Soc. C.E.; age 31; married; 12 years experience—6 in responsible charge as construction manager, contractor's superintendent, consulting engineer. Sewer, water, gas, oil, buildings, bridges, irrigation. Speaks Spanish. Traveled, capable engineer, business executive, typist, secretary, salesman. Open for either United States or foreign country. C-5828.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 30; single; B.S. in civil engineering, Pennsylvania State College; majored in city planning and highway engineering; 9 years experience in general construction; experienced instructor, author, public speaker, and executive. Desires position as instructor, research or executive work in civil engineering. D-2776.

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; 43; married; graduate civil engineer; 20 years experience; New Jersey license; last 10 years field engineer with Portland Cement Association; contact with contractors, state, county, and municipal officials; design and construction of concrete pavements. Desires connection in cement industry. Location immaterial, if position is permanent. Available immediately. D-1250.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; single; B.S., C.E.; 2 years on survey, design, and construction of highways; 3 months structural steel detailing; 2 years water-works distribution surveys, in Mid-Western cities, including testing of pumps and water measuring and storage equipment, preparation of flow charts, maps, reports, and recommendations for system improvements. Available now. Location anywhere. C-6123.

STRUCTURAL ENGINEER EXECUTIVE; M. Am. Soc. C.E.; 46; married; actively engaged in steel fabricating business for past 20 years. Thoroughly experienced in supervision of all departments of engineering, operations and sales with leading concerns. Available immediately. C-5095.

EXECUTIVE; M. Am. Soc. C.E.; 46; 10 years experience on valuation of public utilities, expert witness; 3 years efficiency engineering management, municipal utilities; 10 years executive of large finance company. Knows management, banking, insurance, operation and maintenance of utilities. Available immediately. Location anywhere. Would be good technical assistant to banker or executive. B-2530.

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; 19 years experience in sanitary and municipal work, embracing design and construction of sewerage systems, including treatment works, water supply systems, streets and pavements, preliminary investigations and reports. Technical graduate. Married. Seeks connection with consulting engineering or contracting firm. A-466.

JUNIOR

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 22; single; B.S., C.E., Brooklyn Polytechnic Institute, 1933. Majored in construction and composition of asphalt pavements. Competent mathematician, draftsman, surveyor; 9 months experience drafting, surveying. On civil service list as draftsman. Best references. Desires position in any branch of civil engineering, field or office. Available immediately. Location immaterial. D-2824.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 29; mine engineering, University of Wisconsin; 6½ years engineering experience as follows: 3 years municipal, 2 years highway, 1½ years mining; wide experience in surface and underground surveying and mapping; speaks Spanish. Will accept any desirable domestic or foreign employment in June. D-2515.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 23; single; B.S. in C.E. Passed recent U.S. Civil Service examinations for junior engineering draftsman and dredging inspector. Desires work in any branch of civil engineering, surveying, structural, sanitary, etc. Location immaterial. Available on short notice. D-2848.

ENGINEER; Jun. Am. Soc. C.E.; 24; single; B.C.E., Brooklyn Polytechnic Institute, 1932. Competent mathematician, draftsman; licensed land surveyor, New York; 8 years office and field experience; city, farm, title, topographical, private geodetic surveys; street and sewer locations; tenement-house and office building construction. Desires permanent connection any form of civil engineering, surveying, bridge design, etc. Location immaterial. D-2661.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 25; single; graduate of Rensselaer Polytechnic Institute, C.E., 1931; 2¼ years experience in highway design, survey, and construction with Suffolk County Highway Department, New York. Desires any engineering position. Location immaterial. Available immediately. D-2142.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 24; single; C.E. degree from Rensselaer Polytechnic Institute. Neat and accurate draftsman. Thoroughly experienced in uses of transit, level, plane table, and hand level. Surveying computations a specialty. C-9793.

GRADUATE CIVIL ENGINEER; Jun. Am. Soc. C.E.; 24; single; C.E. and B.S., College of the City of New York, 1932; field instructor in surveying; draftsman. Desires work on construction or in surveying. Location immaterial. D-2851.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 27; graduate; 4 years experience on construction projects, mostly with contractors; wide experience; chief of party, hydrographic surveys, designing, estimating, inspection, planning. Excellent health. Prefers work with contractor anywhere. Available on short notice. D-1921.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 23; single; B.S. in C.E., Bucknell University, 1932; 10 months experience, office work in large banking institution; good mathematician; competent and reliable. Desires opportunity in any branch of civil engineering or teaching. Available immediately. Salary secondary. Location immaterial. D-2186.

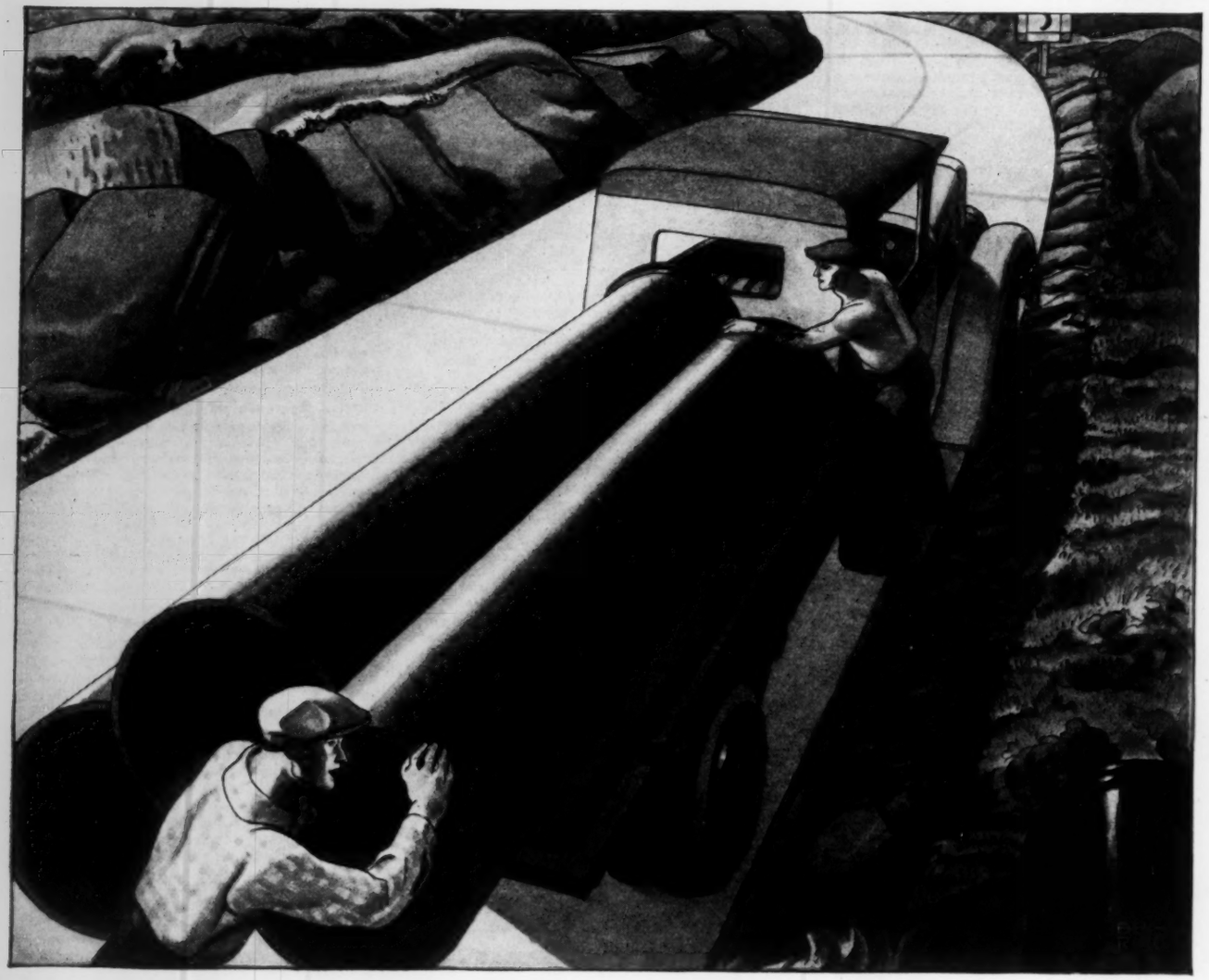
PRODUCTION ENGINEER; Jun. Am. Soc. C.E.; 25; B.S. in C.E., Lehigh University; candidate this year for M.S. in C.E., Lehigh University; major in concrete, minor in business administration; 2 years with New Jersey Highway Commission. Desires position in ready-mix concrete plant or in construction. Location in East preferred. D-2874.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; graduate of Rensselaer Polytechnic Institute, 1931; 24; single; 2 years with field party on heavy construction. Desires a position with chance of advancement with consulting engineer, contractor, or corporation. Available on short notice. Location immaterial. D-2876.

MISCELLANEOUS

EXPERT WITNESS in the fields of water supply, drainage, and sewerage; M. Am. Soc. C.E. Prepared to make a complete inventory and appraisal and to take the witness stand in a competent manner. Licensed in New York and New Jersey and qualified as expert in Connecticut. D-704.

Doubled impact-strength of means doubled protection



The WRONG *way to unload pipe from a truck*

Most engineers suspect what all pipe founders know—that many a pipe failure got its start through damage to the pipe somewhere along the line from the foundry to under the ground. We cannot control the handling hazards in transit, unloading and distribution but *we have reduced* their potentiality of damage to our pipe.

Two years ago our research and technical staffs undertook to develop a super-pipe with impact-resistance increased to a degree which would mean maximum protection from plant to underground. After many experiments the Super-de Lavaud process was discovered and perfected, resulting in a cast iron pipe which is shatter-proofed to the extent that

IMPACT-RESISTANCE IS INCREASED 100%

Super-de Lavaud Cast Iron Pipe is centrifugally cast by a patented improved process. This process is the combined result of a basic discovery amounting to a revolutionary

SUPER-DE LAVAUD PIPE against handling hazards

The RIGHT *way to unload pipe from a truck*

metallurgical change plus improved annealing. It has been standard practise in our Centrifugal Pipe Units for more than a year.

The greatly increased *impact-resistance* and the *non-shattering characteristic* of Super-de Lavaud Pipe are due to a fundamental change in metal structure resulting in a tougher pipe. These advantages have been secured while maintaining high tensile and bursting strength; also the resistance to corrosion for which cast iron pipe is celebrated. Obviously, Super-de Lavaud Pipe exceeds in all respects the requirements of the Federal Specifications Board for this product.

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SALES

SALES MANAGER AND STRUCTURAL ENGINEER; Assoc. M. Am. Soc. C.E.; 40; married; graduate; high-class sales executive with long experience in sales and structural engineering, specializing in steel requirements for bridges and buildings. Seeking connection with building material manufacturer or general contractor. Qualified district sales manager. Good designer and estimator. Available soon. D-16.

BUSINESS GETTER; Assoc. M. Am. Soc. C.E.; suasive contacts with a particular class of colleges, schools, and hospitals; open for engagement by large firm having a meritorious product. Commission with drawing account. B-9276.

TEACHING

CIVIL ENGINEER; M. Am. Soc. C.E.; S.P.E.E.; Methodist Church; Masonic Lodge; Degrees B.S., C.E., M.S. (major structural; minor highway); age 43; 5 years practical experience; 13 years successful teaching (one location) including 9 years as city engineer. Desires position teaching civil engineering or applied mechanics or position with consulting engineer. D-302.

STRUCTURAL ENGINEER; Assoc. M. Am. Soc. C.E.; unmarried; 31; undergraduate and graduate degrees in mathematics and engineering from leading universities; 7 years experience on the design of all types of structures, steel and concrete. Desires position teaching structural engineering, applied mechanics, physics, or mathematics. D-1860.

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; desires teaching position; 30; B.S. in engineering at Princeton University, 1926; New York State license. Author of several technical papers. Unusual background of underpinning, subway, and heavy construction work. Formerly chief assistant to well-known consulting engineer. Interested in experiments with earth pressures. C-9232.

ASSOCIATE PROFESSOR OF CIVIL ENGINEERING; Jun. Am. Soc. C.E.; 32; married; engineering graduate; postgraduate work in hydraulics and sanitary engineering, University of Iowa; 8 years responsible teaching; 4 years present position, in charge of hydraulics, water supply, sewage, materials testing, engineering drawing. Practical and teaching experience in surveying and road and bridge construction. C-5726.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 25; A.B., Dartmouth College, 1929; C.E., Thayer School of Civil Engineering, 1930; M.S., Rutgers University, 1933; 1½ years as structural detailer; 4 months on construction. Desires position teaching structures or applied mechanics or working on construction job. C-9997.

RECENT BOOKS

New books of interest to Civil Engineers, donated by the publishers to the Engineering Societies Library, or to the Society's Reading Room, will be found listed here. A comprehensive statement regarding the service which the Library makes available to members is to be found on page 87 of the Year Book for 1933. These notes regarding the books are taken from the books themselves, and this Society is not responsible for them.

AMERICAN SOCIETY FOR TESTING MATERIALS. PROCEEDINGS, 36th Annual Meeting, Chicago, Ill., June 26–30, 1933. Vol. 33, Parts 1 and 2. Philadelphia, A.S.T.M., 1933. Part 1, 1092 pp.; Part 2, 804 pp., illus., diagrs., charts, tables, 9 × 6 in., paper, $5.50.

The proceedings contain the reports of the various committees, new and revised tentative standards, tentative revisions of current standards, and the technical papers presented at the meeting, including numerous papers on the testing of metals, cement, concrete, and other materials.

DAS LÄRMFREIE WOHNHAUS, herausgegeben vom Fachausschuss für Lärmminderung beim Verein deutscher Ingenieure. Berlin, VDI-Verlag, 1934. 90 pp., illus., diagrs., charts, 8 × 6 in., paper, 2.50 rm.

A discussion of the prevention and suppression of noise from the point of view of the builder and owner. The effect of noise upon human beings, methods of measurement, and practical methods for constructing soundproof buildings are described with sufficient detail. The book is issued by the Noise Prevention Section of the Society of German Engineers.

DEPRECIATION, a Review of Legal and Accounting Problems by the Staff of the Public Service Commission of Wisconsin. Submitted to the National Association of Railroad and Utilities Commissioners at its 45th Annual Convention in Cincinnati, Ohio, October 11, 1933. New York, State Law Reporting Co., 1933. 196 pp., charts, tables, 9 × 6 in., paper, $1.50; cloth, $1.85.

This report, prepared at the request of the National Association of Railroad and Utilities Commissioners, presents the view of the Wisconsin Public Service Commission as to the depreciation policy that should ultimately be adopted, and discusses some of the outstanding problems and legal principles confronting commissions. Among the items considered are the meaning of depreciation, methods of accounting, depreciation as a factor in valuation, legal doctrines, depreciation reserves, and methods of estimating service life and depreciation reserve requirements.

EASILY INTERPOLATED TRIGONOMETRIC TABLES WITH NON-INTERPOLATING LOGS, COLOGS, AND ANTILOGS (Editions 6 and 7 of the Simplified Series). By F. W. Johnson. San Francisco, Simplified Series Publishing Co., 1933. 256 pp., tables, 10 × 7 in., paper (No. 6) $1.85; fabrikoid (No. 7) $3.50.

Edition No. 6 consists of an ingenious loose-leaf form, which can be kept up to date by frequent additions. Edition No. 7 has permanent bindings in book form. In content, the non-interpolating feature is valuable, giving directly four and five-place logarithms and antilogarithms. The trigonometric functions are similarly simplified. Marginal cut-out indexes are supplied, reading from both the front and the back. The form and layout of the tables appear to fit admirably the demands of utility, convenience, and durability.

GRAZHDANSKIE SOORUZHENIYA NA PUTYAKH SOOBSHCHENIYA (Civil Engineering Construction on Ways of Communication). By V. A. Glasyrin. Moscow and Leningrad, AKPO Goszheldorizdat, 1933. 238 pp., diagrs., tables, maps, 10 × 7 in., cloth, 4 rubles (1 ruble for binding).

The work of the buildings department of a railroad system is presented in this manual, which is announced as the first to be published in Russia. Station planning and construction, yard layouts, train sheds, and other structures are discussed in detail.

MUNICIPAL SANITATION. By W. A. Hardenbergh. Scranton, Pa., International Textbook Co., 1932. Diagrs., illus., tables, 8 × 5 in., leather, $1.75.

The rudiments of water purification, sewage treatment, and refuse disposal are presented clearly and practically.

PLANNING AND NATIONAL RECOVERY. Planning Problems Presented at the Twenty-fifth National Conference on City Planning, Held Jointly with the American Civic Association, at Baltimore, Maryland, Oct. 9–11, 1933. Published for the Conference by Wm. F. Fell Co., Philadelphia, Pa., 158 pp., tables, 9 × 6 in., cloth, $3.

The papers presented at this conference fall into three groups: planning and national recovery; large-scale regional and rural land planning; slum clearance and city planning. Various aspects of each of these problems were presented by experts and discussed by others.

(DER) PRAKTISCHE STAHLHOCHBAU, Vol. 4. Geschweisste Stahlbauten. By A. Gregor. Berlin-Charlottenburg, Robert Kiepert, 1932. 128 pp., illus., diagrs., tables, 11 × 8 in., cloth, 18.20 r.m.

Although published as the fourth volume of the author's well-known treatise on steel buildings, this work can be used independently. The first section is a review of welding practice, based upon the official German standards for welding steel structures. Succeeding sections discuss such matters as the design and construction of factory buildings, tall buildings, beams, and columns.

STEINBEARBEITUNG. (Berichte über betriebswissenschaftliche Arbeiten, Band 10). By K. Röder, W. Gruner, W. Kerner, and G. Pahlitzsch. Berlin, VDI-Verlag, 1933. 41 pp., illus., diagrs., charts, tables, 12 × 8 in., paper, 7.50 rm.

The relations between the strength of various building stones and their workability are discussed in this brochure, which reports a series of investigations of the behavior of typical varieties when cut, planed, turned, and drilled.

SUSPENSION BRIDGES—A CENTURY OF PROGRESS. Trenton, N. J., John A. Roebling's Sons Company, 1934. 141 pp., illus., tables, diagrs., 8½ × 5½ in., paper. Free to interested engineers.

The development of the suspension bridge in the western hemisphere, particularly the part played by the Roebling Company, is covered briefly yet quite completeiy in this booklet. Much technical information is given in an interesting form, suitably illustrated. The result is an attractive general manual on this important and popular type of bridge.

TECHNIK GESCHICHTE. (Beiträge zur Geschichte der Technik und Industrie, Bd. 22, 1933). Berlin, VDI-Verlag, 1933. 156 pp., illus., diagrs., 12 × 8 in., cloth, 12 rm.

The new volume of this important annual contains valuable papers on many branches of industry. Early Alpine roads, transportation in the Middle Ages, pre-Christian foundry practice, the oldest use of iron, and other topics are discussed by authorities.

TESTS ON STRUCTURAL MODELS OF PROPOSED SAN FRANCISCO-OAKLAND SUSPENSION BRIDGE. By George E. Beggs, Raymond E. Davis, and Harner E. Davis. Berkeley, Calif., University of California Press, 1933. 107 pp., illus., tables, diagrs., 4 supp. plates, 10½ × 8¼ in., paper, $1.50.

This study indicates that the deflection theory permits calculation of main cable stresses without appreciable error; that the method of Moisseiff and Lienhard is closely accurate for determining the lateral deflections of trusses and cables; and that a modification of the Dana method gives reliable results for vertical-truss and longitudinal-tower deflections. A bibliography is included.

UNTERSUCHUNGEN AN DER BETONPUMPE DER TORKRET G.m.b.H. (Mitteilungen des Forschungsinstituts für Maschinenwesen beim Baubetrieb, Heft 6). By G. Grassmann. Berlin, VDI-Verlag, 1933. 28 pp., illus., diagrs., charts, tables, 12 × 8 in., paper, 7.50 rm.

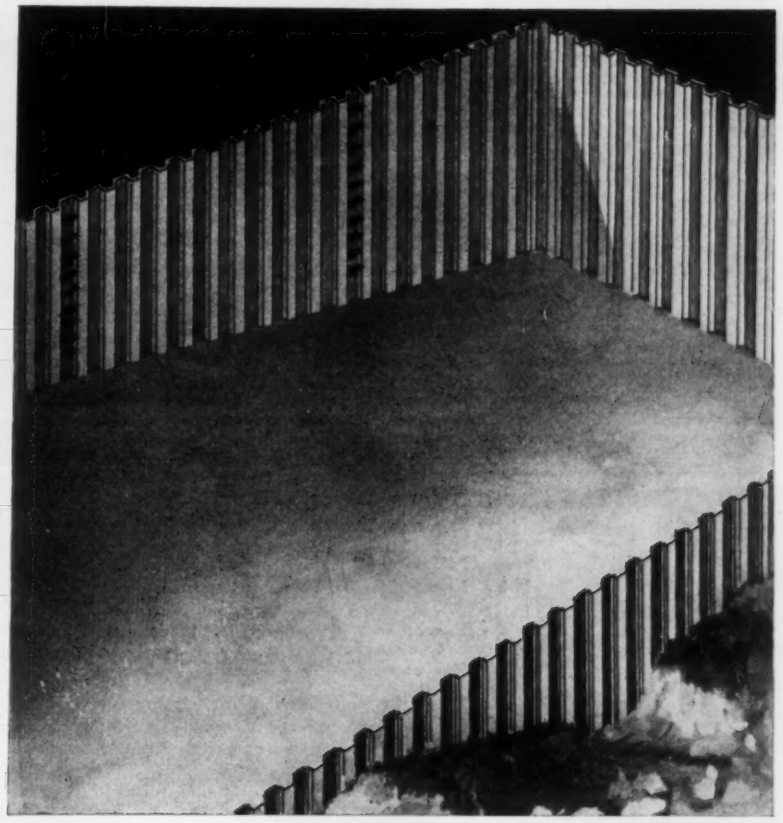
The results of an exhaustive test of a pump for hoisting concrete in small building operations, invented by Giese and Hell and manufactured by the Torkret Company. The effect of pumping upon the quality of the concrete and the efficiency and economy of the pump have been considered.

(THE) VALUATION AND REGULATION OF PUBLIC UTILITIES. By J. H. Gray and J. Levin. New York and London, Harper and Brothers Publishers, 1933. 143 pp., 8 × 5 in., paper, 75 cents; cloth, $1.

A clear, concise outline of the subject of the regulation of public utilities. The history of regulation is briefly traced, and the attempt at regulation by commissions is analyzed. The reasons why present methods have failed to meet public needs are discussed.

WATERMILLS AND WINDMILLS, a Historical Survey of Their Rise, Decline, and Fall as Portrayed by Those of Kent. Written and illustrated by W. C. Finch. London, C. W. Daniel Co., 1933. 336 pp., illus., maps, 10 × 7 in., cloth, 15s.

The history of over four hundred windmills is given in this volume. Photographs of over two hundred windmills are presented, as well as a hundred pictures of things connected with milling.



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CIVIL ENGINEER; Jun. Am. Soc. C.E.; 25; single; B.S.C.E., West Virginia University; on U. S. Civil Service Reemployment List, junior civil and junior structural engineer; 2 years office and field experience, surveying, drafting, estimating, and construction. Desires position with chance of advancement with consulting engineer, contractor, or any branch civil engineering. Location immaterial. D-2903.

STUDENT CHAPTER MEMBER; will graduate from Pennsylvania Military College, June 12, 1934, with a civil engineering degree. Speaks Spanish fluently. Desires work as surveyor, topographer, inspector, translator, or draftsman. Location in Latin-America preferred. D-2904.

SALES

SALES MANAGER AND STRUCTURAL ENGINEER; Assoc. M. Am. Soc. C.E.; 40; married; graduate; high-class sales executive with long experience in sales and structural engineering, specializing in steel requirements for bridges and buildings. Seeking connection with building material manufacturer or general contractor. Qualified district sales manager. Good designer and estimator. Available soon. D-16.

TEACHING

CIVIL AND STRUCTURAL ENGINEER; M. Am. Soc. C.E.; B.S., C.E.; 40; married; 13 years teaching civil and structural engineering; 6 years commercial experience covering railroad track work; water supply; design and construction, buildings, bridges; 3,000 inches technical publications. Employed as professor of structural engineering. Desires similar position, or as executive, in larger community. B-3330.

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; married; B.S. in C.E., Massachusetts Institute of Technology; M.S. in C.E., Yale University; recent graduate study at Massachusetts Institute of Technology; 10½ years practical experience in design and construction of bridges, buildings, and dams; 10 years teaching structural engineering, concrete and descriptive geometry at leading university. Location in East preferred. B-3516.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 30; single; B.S. in civil engineering, Pennsylvania State College; majored in city planning and highway engineering; 9 years experience general construction; experienced instructor, author, public speaker, and executive; desires position as instructor, research or executive in civil engineering. D-2776.

STRUCTURAL ENGINEER; Assoc. M. Am. Soc. C.E.; unmarried; 31; undergraduate and graduate degrees in mathematics and engineering from leading universities; 7 years experience on the design of all types of structures, steel and concrete. Desires position teaching structural engineering, applied mechanics, physics, or mathematics. D-1860.

CIVIL AND STRUCTURAL ENGINEER; Jun. Am. Soc. C.E.; 25; single; B.S. in C.E., Kansas State College; M.S. in C.E., West Virginia University. Experienced in bridge and concrete design; inspection of highway construction; construction surveys; drafting. Prefers position with consulting engineer or as instructor in civil engineering at some college. D-2804.

ENGINEER; Jun. Am. Soc. C.E.; graduate of Massachusetts Institute of Technology in civil engineering; single; 4 years experience teaching differential and integral calculus; 6 years experience in all phases of building industry; desires full-time teaching position or fellowship in mathematics or civil engineering. Location immaterial. C-3262.

STRUCTURAL ENGINEER; Jun. Am. Soc. C.E.; desires position teaching structural engineering, organizing; teaching graduate courses. On staff of leading engineering school past 3 years. Married; 27; S.M., Massachusetts Institute of Technology, 1930; 1 year structural study in Europe. Experience, structural detailing, design. Also interested in position with consulting engineer. D-2896.

FORMER PRINCIPAL ASSISTANT to distinguished consulting engineer desires teaching position; Assoc. M. Am. Soc. C.E.; offers unusual background of responsible charge of some of the most difficult and interesting tunnel, subway, and underpinning work ever undertaken; author of technical papers; B.S. in E., Princeton University, 1926; New York State license. C-9232.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 26; married; B.S., C.E., Lafayette College, 1929; M.S., University of Minnesota, 1933; 1¼ years structural detailer; 4 years as instructor, surveying and structures, Mid-Western university; 4 summers practical surveying; 1 summer highway inspection. Desires position teaching structures, surveying, mathematics, or mechanics, or any engineering position. Location immaterial. C-6966.

CIVIL ENGINEER; M. Am. Soc. C.E.; S.P.E.E.; registered professional engineer; 40; married; degrees B.C.E., M.S., and C.E.; 6 years practical experience; 14 years teaching engineering drawing, applied mechanics, and civil engineering departments, also administrative work; excellent teacher, now teaching; desires to change location. D-2687.

RECENT BOOKS

New books of interest to civil engineers, donated by the publishers to the Engineering Societies Library, or to the Society's Reading Room, will be found listed here. A comprehensive statement regarding the service which the Library makes available to members is to be found on page 75 of the Year Book for 1934. These notes regarding the books are taken from the books themselves, and this Society is not responsible for them.

ALLOYS OF IRON AND TUNGSTEN. (Alloys of Iron Research Monograph Series.) By J. L. Gregg. New York and London, publ. for the Engineering Foundation by McGraw-Hill Book Co., 1934. 511 pp., illus., diagrs., charts, tables, 9 × 6 in., cloth, $6.

The third volume of this valuable series does for the iron-tungsten alloys what previous volumes have done for those of iron and molybdenum and iron and silicon. From some 1,800 articles, scattered among hundreds of books and periodicals, the essential data have been assembled and woven into a comprehensive, critical summary. A selected bibliography, containing over five hundred references, is given.

HIGHER MATHEMATICS FOR ENGINEERS AND PHYSICISTS. By I. S. and E. S. Sokolnikoff. New York and London, McGraw-Hill Book Co., 1934. 482 pp., diagrs., tables, 9 × 6 in., cloth, $4.

The purpose of this book is to give students of engineering and other applied sciences a bird's-eye view of the parts of mathematics that are indispensable to a study of the physical sciences.

IMPACT TESTING OF CAST IRON. Report of Subcommittee XV of Committee A-3 on Cast Iron. Philadelphia, American Society for Testing Materials, 1934. 51 pp., illus., diagrs., charts, tables, 9 × 6 in., paper, 50 cents.

This report by a committee of the American Society for Testing Materials discusses the usefulness of the several forms of impact test as applied to cast iron. An extensive program of tests formed the basis for the report, which contains the results and the conclusion of the committee.

INDUSTRIALIZED RUSSIA. By A. Hirsch. New York, Chemical Catalog Co., 1934. 309 pp., illus., tables, 8 × 6 in., cloth, $3.

As chief consultant to the Soviet Heavy Chemical Industry, Dr. Hirsch has had unusual opportunity to study the basic industries of the country. In this book he presents pertinent facts about the present status of the chemical, metallurgical, agricultural, and other industries, and discusses business, government, law, living conditions, education, etc. There is a bibliography.

MITTEILUNGEN AUS DEN FORSCHUNGSANSTALTEN GHH-KONZERN. Band 2, Heft 10. January 1934. Berlin, VDI-Verlag, pp. 263–288, illus., diagrs., charts, tables, 12 × 8 in., paper, 2.90 rm.

These papers include a description of a bascule bridge of a novel type, erected at Buenos Aires after plans by A. Ottanelli; a simple method for determining chromium in vanadium and molybdenum steels; an investigation of the effect of silicon upon the structure and shrinkage of iron-carbon alloys; and a report upon operating results with a rotary steam economizer.

PERMANENT PROSPERITY AND HOW TO GET IT. By J. Bauer and N. Gold. New York and London, Harper and Brothers, 1934. 251 pp., 9 × 6 in., cloth, $2.75.

This book presents the thesis that there should be, as the basic requirement of progress, security of employment for every one and continuity of socially productive enterprises. The plan for achieving this includes a long-time program of public works dovetailed with slackness in private industry, banking and monetary reforms looking to stabilization of money and credit, and the enhancement of purchasing power.

RICHARD TREVITHICK, THE ENGINEER AND THE MAN. (Trevithick Centenary Commemoration Memorial Volume.) By H. W. Dickinson and A. Titley. Cambridge (England), University Press; New York, Macmillan Co., 1934. 290 pp., illus., diagrs., 10 × 6 in., cloth, $5.

This account of the life and work of a great engineer was published to commemorate the centenary of his death. Trevithick was a pioneer in the use of high-pressure steam, an early experimenter with steam road carriages, and the builder of the first steam locomotive. He attempted to tunnel beneath the Thames and introduced high-pressure hoisting and pumping engines into Peruvian mines. This biography is an attractive and accurate account of the man.

SCHWINGUNGSTECHNIK. Bd. 2. Schwingungen eingliedriger Systeme mit stetiger Energiezufuhr. By E. Lehr. Berlin, J. Springer, 1934. 373 pp., diagrs., charts, tables, 9 × 6 in., cloth, 31.50 rm.

This is the second instalment of a comprehensive treatise on vibration, in which the subject is discussed from the viewpoint of the engineer and machine builder. Forced vibrations, resonance, and pseudo-harmonic vibrations are considered.

THEORY OF ELASTICITY. (Engineering Societies Monographs.) By S. Timoshenko. New York and London, McGraw-Hill Book Co., 1934. 416 pp., illus., diagrs., charts, tables, 9 × 6 in., cloth, $5.

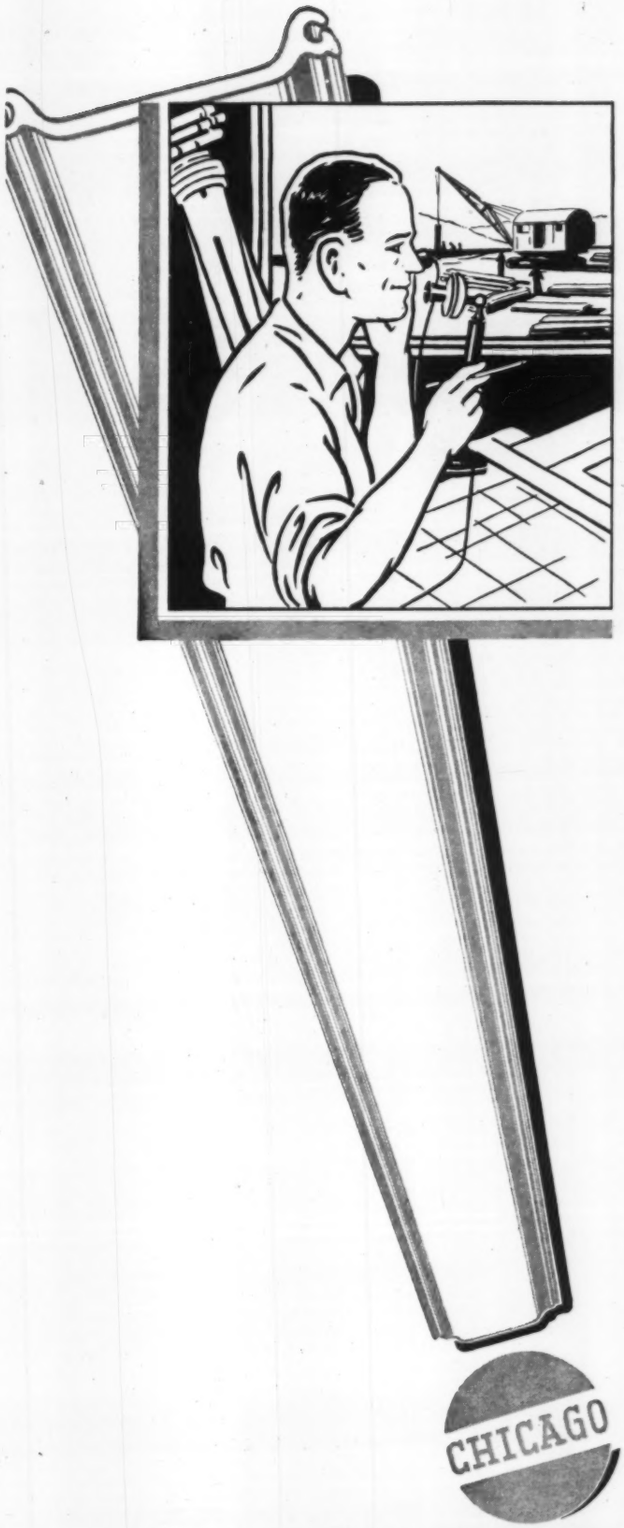
This book presents the fundamentals of the theory of elasticity with special reference to the needs of the engineer. The presentation considers both two-dimensional and three-dimensional problems and solutions of special problems of practical importance. The photo-elastic, soap-film, and other experimental methods are included. This book is the third in the series of Engineering Societies Monographs.

VERMESSUNGSKUNDE. (Handbibliothek für Bauingenieure, Vol. 4, Pt. 1.) By M. Näbauer. 2 ed. Berlin, Julius Springer, 1932. 401 pp., diagrs., charts, 10 × 7 in., cloth, 23.50 rm.

A reference book for civil engineers on those branches of higher surveying that are likely to be required in practice. The elements of the theory of errors are discussed, and there is an unusually full discussion of instruments. Methods of surveying are described, with full attention to photographic methods. Sections are devoted to mapping and plotting. The book affords a useful summary of modern developments.

WASSERBAULICHE STRÖMUNGSLEHRE. By P. Neményi. Leipzig, Johann Ambrosius Barth, 1933. 275 pp., illus., diagrs., charts, tables, 10 × 7 in., paper, 28 rm.; bound, 29.80 rm.

A critical, systematic review of the physics of flow for those interested in the construction of hydraulic works. An introductory section on basic principles is followed by sections on flow in pipes, in open channels with stationary and shifting beds, flow of ground water, the free fall of water, and technical aid of hydraulic work. An enlarged and modernized edition of the author's contribution to the "Handbuch der physikalischen und technischen Mechanik."



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JUNIOR

CIVIL ENGINEER; Jun. Am. Soc. C.E.; single; B.S. in C.E., Bucknell University, 1932; 2 months experience on electric line construction; experienced in uses of transit, levels, and plane table; draftsman. Desires opportunity in any branch of civil engineering. Available immediately. Salary secondary. Location immaterial. D-2924.

JUNIOR ENGINEER; Jun. Am. Soc. C.E.; B.S. in C.E.; age 24; single; desires permanent connection with active contractor or corporation. Experience: 2 years on city surveys; 4 years on subway construction. A proficient surveyor, draftsman, estimator, and designer. Knowledge of Spanish; location immaterial; references. D-1803.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 25; single; B.S. in E. and C.E.; on State Civil Service List for District Land Surveyor. Desires position in any branch of civil engineering. Salary secondary. Location immaterial. Available immediately. C-9890.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 22; single; B.S. in C.E., Newark College of Engineering; 1 year as assistant in civil engineering office; 1 year as physics instructor; 6 months as supervisor of motor vehicle traffic survey. Desires opportunity in any branch of civil engineering. Location secondary. D-2960.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; graduate civil engineer; 6 years experience with contractors, state and municipal engineers; construction, design, and survey of highways, parkways, sewers, and water systems; in responsible charge of construction and survey parties. Available immediately. Location immaterial. C-7417.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 27; single; graduate; 4 years on river tunnel construction, mostly with contractors, as assistant engineer. Wide experience includes dredging and soundings, inspection; steel, concrete, and timber design; chief of party, land and river surveys; chief draftsman and checker; excellent health; will go anywhere with construction outfit. D-1921.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 26; single; B.S. in C.E., Duke University, 1933. Majored in structural steel design and water supply; 1 month on water and sewage; 3 years as inspector on telephone apparatus. Desires opportunity in any branch of civil engineering. Location immaterial. Available immediately. D-2683.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 25; single; B.S. in C.E., West Virginia University; on U. S. Civil Service Reemployment List, junior civil and junior structural engineer; 2 years office and field experience, surveying, drafting, estimating, and construction. Desires position with chance of advancement with consulting engineer, contractor, or in branch civil engineering. Location immaterial. D-2903.

GRADUATE ENGINEER; Jun. Am. Soc. C.E.; 23; Polytechnic Institute of Brooklyn, 1933, B.C.E.; 1 year additional study as graduate fellow. Majored in advanced structures and engineering economics. Will take temporary or permanent work in field or office. Some experience on railroad construction projects. Opportunity for active and ambitious person desired. D-2990.

ENGINEER; Jun. Am. Soc. C.E.; B.C.E., Ohio State University; age 23; single. Experience in surveying. Would prefer hydrology or structural engineering work. Location and salary secondary. D-2994.

TEACHING

TECHNICAL WRITING; Assoc. M. Am. Soc. C.E.; 34; married; degrees, B.S. in C.E., C.E.; Pennsylvania state license. Unusual experience writing specifications for subways, buildings, highways, sewers, and their appurtenances, also teaching. Desires position, preferably in Pennsylvania, New Jersey, or New York, teaching civil engineering, with consulting engineer, or editorial work. D-1941.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 29; single; A.B., B.S. in C.E., M.S. in water power; 1 year sales experience; 2 years on survey and construction of water power plants; 4 years as instructor in hydraulics and mechanics, university engineering school. Fluent German; knowledge of French. Desires position as foreign representative or teaching situation. Available July 1 D-2946.

RECENT BOOKS

New books of interest to Civil Engineers, donated by the publishers to the Engineering Societies Library, or to the Society's Reading Room, will be found listed here. A comprehensive statement regarding the service which the Library makes available to members is to be found on page 75 of the Year Book for 1934. These notes regarding the books are taken from the books themselves, and this Society is not responsible for them.

A.I.S.C. MANUAL OF STEEL CONSTRUCTION. Revised Edition. New York, American Institute of Steel Construction, 1934. 352 pp., $2; to students $1.50. (Postage 10 cents.)

This new edition, recast and improved, is a product of extensive study by expert practicing engineers. As a particular feature it gives details and safe loads for the newly standardized wide-flange sections. By its completeness in this and other topics, it eliminates the former steel company handbooks. It is prepared, in durable and pleasing form, for the ready and convenient use of the designer.

ANGEWANDTE HYDROMECHANIK. Bd. 2. By W. Kaufmann. Berlin, Julius Springer, 1934. 293 pp., illus., diagrs., charts, tables, 9 × 6 in., leather, 18 rm., bd.

The first volume of this treatise, published in 1931, discussed general theoretical investigations of hydromechanical problems. In this volume, which can be used independently, the author treats such topics as discharge from vessels, flow over weirs, flow in pipes and open channels, wave motion, ground-water movement, the hydrodynamic theory of the friction of lubricants, the elements of flow in airplane wings, propellers and turbines, ship resistance, and wind stresses in structures.

BUILDING AN ENGINEERING CAREER. By C. C. Williams. New York and London, McGraw-Hill Book Co., 1934. 247 pp., illus., diagrs., charts, tables, 8 × 6 in., cloth, $2.

An interesting textbook, based on the orientation and motivation courses given at the State University of Iowa. The work aims to give the student a preview of the character of the profession and of its relation to social organization, to assist him to adopt efficient methods of study, to indicate the nature of the engineer's mode of thinking, to afford a historical background, and to indicate future possibilities.

CENTRIFUGAL PUMPS, TURBINES, AND PROPELLERS. Basic Theory and Characteristics. By W. Spannhake, translated from the German by J. B. Drisko. Cambridge, Mass., Technology Press, 1934. 328 pp., illus., diagrs., charts, tables, 10 × 6 in., cloth, $5.

This volume is intended to enable the reader to understand the operation and operating characteristics of existing rotary hydraulic machinery by a presentation of the concepts of fluid mechanics, and to instruct him in the design of these machines. A logical method of analyzing pump and turbine operation is developed, and a fundamental procedure for design is presented.

DER DURCHLAUFENDE TRÄGER, GEBRAUCHSFERTIGE FORMELN UND TABELLEN. By A. Kleinlogel. 2 ed. Berlin, Wilhelm Ernst & Sohn, 1934. 192 pp., diagrs., charts, tables, 10 × 7 in., paper, 17 rm.; bound, 18.50 rm.

This handbook is intended to lighten the labors of the designer by providing ready-to-use equations and formulas for continuous beams under various conditions. Twenty forms of beams, covering all those ordinarily used, are discussed. A brief introduction to the theory of the continuous beam is provided, and the use of the formulas is shown by a number of fully worked examples. The new edition has been carefully revised.

ENTSTAUBUNGS- UND LÜFTUNGSFRAGEN IN DER WERKSTATT. By R. Nagel. Berlin, VDI-Verlag, 1934. 21 pp., illus., diagrs., 8 × 6 in., paper, 1.80 rm.

This pamphlet presents the fundamentals of factory ventilation and dust removal in a concise, practical way. It is intended to give the factory manager a general view of the subject that will enable him to devise methods for his own needs. The illustrations show actual installations.

FUNDAMENTALS OF HYDRO- AND AEROMECHANICS, based on lectures of L. Prandtl. (Engineering Societies Monographs.) By O. G. Tietjens, translated by L. Rosenhead. 270 pp., $4.

APPLIED HYDRO- AND AEROMECHANICS, based on lectures of L. Prandtl. (Engineering Societies Monographs.) By O. G. Tietjens, translated by J. P. Den Hartog. 311 pp., New York and London, McGraw-Hill Book Co., 1934. illus., diagrs., charts, tables, 9 × 6 in., cloth, $4.

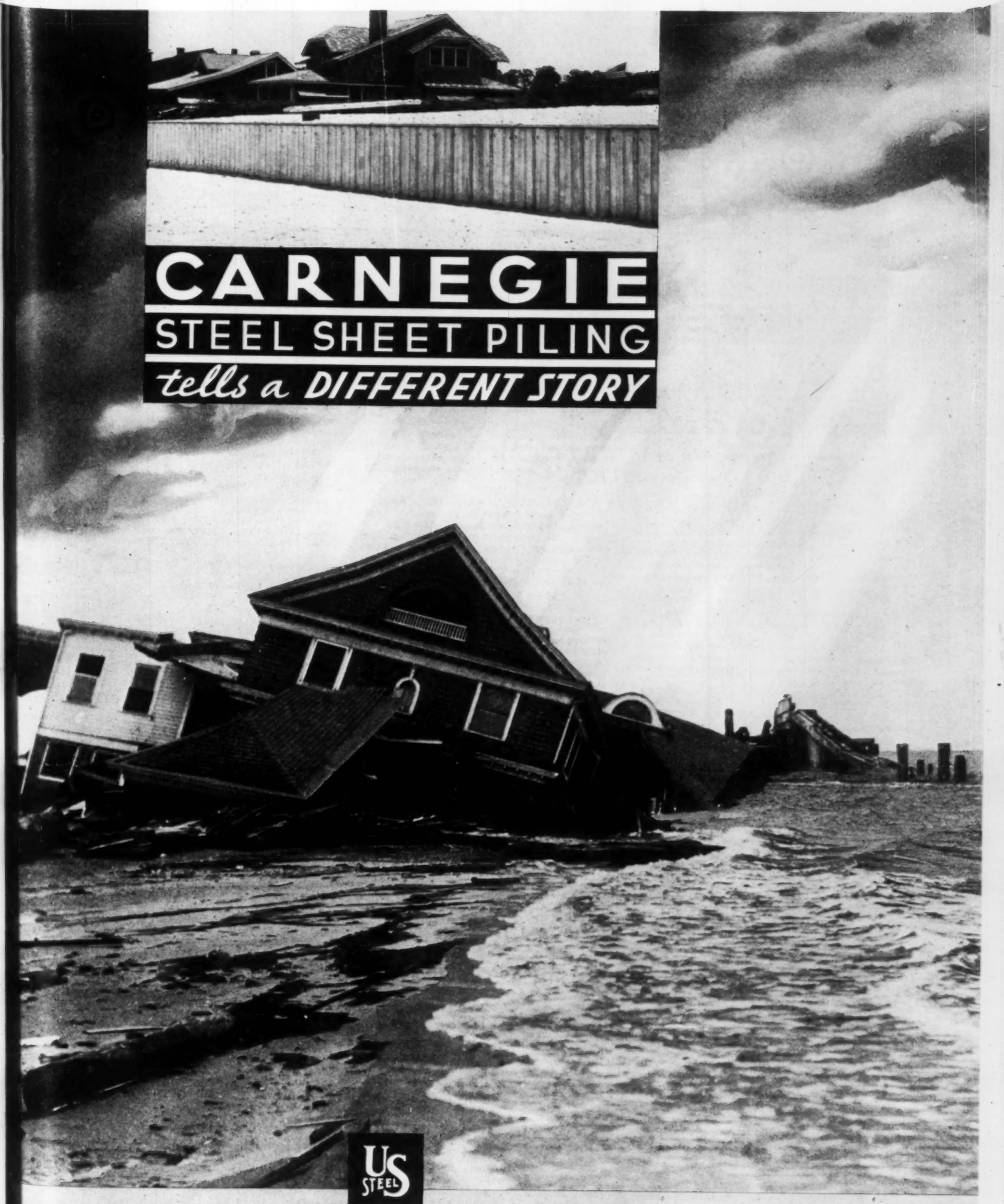
In the "Fundamentals" the author discusses briefly the principles of hydrostatics and, more fully, of aerostatics, and then devotes most of the volume to classical hydrodynamics. The volume on "Applications" discusses the more important applications of fluid mechanics in a scientific manner, with emphasis upon technical treatment rather than mathematical. The laws of similarity, flow in pipes and channels, boundary layers, drag of motion through fluids, and airfoil theory, together with a chapter on experimental methods and apparatus, form the book.

GROWTH AND MOVEMENT IN PORTLAND CEMENT CONCRETE. By C. G. Lynam. New York, Oxford University Press; London, Humphrey Milford, 1934. 139 pp., illus., diagrs., charts, 8½ × 5½ in., cloth, $3.50.

In this study of Portland cement concrete an attempt has been made to link up recent somewhat disconnected discoveries in the fields of creep, elasticity, and bond, and to give a consistent explanation of the various phenomena connected with the subject of concrete. Shrinkage, adhesion, and failure are discussed. A large amount of recorded experimental evidence has been examined and collated, and the more important material is included in this volume.

KEMPE'S ENGINEER'S YEAR BOOK OF FORMULAE, RULES, TABLES, DATA AND MEMORANDA FOR 1933–34. A Compendium of Civil, Mechanical, Electrical, Marine, Gas, Aero, Mine, and Metallurgical Engineering. Rev. by L. St. L. Pendred. 40 ed. London, Morgan Brothers (Publishers) Ltd., 1933. 2623 pp., illus., diagrs., charts, tables, 7 × 5 in., leather, 31s, 6d.

For forty years, engineers who wished a concise, accurate account of the best British practice in every field of engineering have turned to Kempe's Handbook. The current edition has undergone a very thorough revision. All tables and general data have been revised, many illustrations replaced, obsolete material deleted, and several entirely new articles added. The handbook, the work of many specialists, is edited by Mr. Loughnan Pendred.



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These items are from information furnished by the Engineering Societies Employment Service, with offices in Chicago, New York, and San Francisco. The Service is available to all members of the contributing societies. A complete statement of the procedure, the location of offices, and the fee is to be found on page 85 of the 1934 Year Book of the Society. To expedite publication, notices should be sent direct to the Employment Service, 31 West 39th Street, New York, N.Y. Employers should address replies to the key number, care of the New York office, unless the word Chicago or San Francisco follows the key number, when the reply should be sent to the office designated.

Construction

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; 20 years experience on design and construction of roads, railroads, buildings, hydraulics; also statistics, estimating costs, valuation, financial planning, surveying, office work, purchasing, and supervision. Salary no object if position offers possibilities of advancement, and where ability and hard work are appreciated. B-1537.

CONTRACTOR'S ENGINEER; M. Am. Soc. C.E.; 23 years supervision of construction, contracting, design, special studies. Expert on construction plant, costs, preparation of bids, subcontracts, organization and control of work in field and office. C.E. degree. New York State license. Salary commensurate with responsibility. Interview solicited. B-548.

Design

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; 37; married; graduate; state licenses; 10 years experience, surveying, design, and construction. Railroad, highway, parkway, harbor, and tall building projects. Completely familiar with the design of rigid-frame bridges, reinforced concrete or steel, single or multiple span, square or skew. Available immediately. D-1496.

CIVIL AND STRUCTURAL ENGINEER; Jun. Am. Soc. C.E.; licensed professional engineer; 30; B.S. in C.E. and C.E. degrees; experienced as a designer, draftsman, checker, detailer, and estimator of structural steel and reinforced concrete structures. References and samples of work sent on request. C-6186.

STRUCTURAL AND MUNICIPAL ENGINEER; Assoc. M. Am. Soc. C.E.; graduate C.E.; 15 years experience. Experienced designer, estimator, and superintendent, principally on architectural engineering and sewage disposal. Competent to limited extent on mechanical installations, heating and refrigeration, pumps and conveying machinery. Also considerable heavy railroad design and design of movable bridges and cranes. Will go anywhere, including abroad. C-2701.

Executive

STRUCTURAL ENGINEER EXECUTIVE; M. Am. Soc. C.E.; 46; married. Broad experience in engineering and sales of steel fabricating business. Well acquainted with trade in western Pennsylvania, Ohio, and West Virginia. Further detailed information furnished on request. Available immediately. C-5095.

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CIVIL ENGINEER—CITY MANAGER; Assoc. M. Am. Soc. C.E.; member International City Managers' Association; 12 years experience in public utility and municipal engineering work; seeks connection. Location and salary secondary. D-3006.

CIVIL ENGINEER; M. Am. Soc. C.E.; B.S. in C.E.; registered in Pennsylvania; age 38. Broad experience in plant layout, structural design, contract plans and specifications, estimating, and construction. Familiar with water works, sewage disposal, steam power plants, foundations, bridges, viaducts, and general building work. Available at once for responsible charge, or research work. Location Pittsburgh vicinity. D-1525.

STRUCTURAL ENGINEER; Assoc. M. Am. Soc. C.E.; 40; 19 years experience with nationally known engineering, contracting, and industrial corporations; structural steel and reinforced concrete design and construction; familiar with material-handling equipment; preparation of plans and specifications; coordination of office with field; and subcontractor. Desires responsible position. D-3019.

CONSTRUCTION AND MANAGEMENT ENGINEER; M. Am. Soc. C.E.; 48; married; graduate; 15 years experience in drainage and flood control, covering surveys, financial reports, plans, construction; competent to organize and manage construction operations; 2 years in charge of construction of heavy industrial plant; 8 years in charge of development, management, operation, and sale of 50,000-acre farm and timberland. D-3038.

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; 47; good health; married; license, New York, 9½ years drafting, design, and estimating; 18 years in field, all grades to, and including, division engineer. Principal engagements on water supply, hydro-electric, mill, and railroad work. Excellent record with former employers. Location immaterial. B-5199.

EXECUTIVE ENGINEER; Assoc. M. Am. Soc. C.E.; graduate C.E.; 20 years experience, field and office; surveys, concrete construction, estimating, design; responsible charge of field and office work; Eastern district manager for manufacturers' products. References and experience record available. Position in Philadelphia or vicinity preferred. Any locality considered. Salary expected in ratio to work required. D-3049.

POSITION DESIRED BY CIVIL ENGINEER; Assoc. M. Am. Soc.C.E.; Cornell University, 1907; about 25 years experience, including highways and paving, both as engineer and as contractor. Also municipal work, some steam power plant construction, sewers and sewage disposal, railroad work (including one year on New York City subways). Am now convenient to New York but would go anywhere. B-1514.

TELEPHONE ENGINEER; Jun. Am. Soc. C.E.; 29; married; 10 years experience, all phases of telephone management—engineering, construction, maintenance, outside plant, manual and step-by-step dial offices; business office experience. Desires position with telephone company requiring wide practical knowledge; now in active charge of plant maintenance, 11 offices, 16,000 stations; available one month's notice. D-3059.

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; licensed in Pennsylvania; 30; married; Cornell graduate; continuous employment since graduation with one company; over 4 years as office engineer; 2 years as field engineer; 2 years in design. Experience covers industrial work, power plants, railroads, office, store, and apartment buildings. D-2891.

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; age 40; desires to correspond with engineer or land surveyor with established business who desires a partner. B-7815.

ENGINEER MANAGER; M. Am. Soc. C.E.; 47; married; licensed professional engineer, Pennsylvania. Experienced directing construction of bridges, foundations, sewerage, water facilities, etc. Several years making up competitive bids, public and commercial projects, coordinating, expediting subcontracts, sales promotion, and development of mechanical ideas. Chief construction executive past 14 years with two large engineering organizations. Location, East. D-2285.

Junior

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 25; single; B.S. in C.E., Lehigh University, 1931; 3 months as draftsman; 1 month surveying experience; 8 months as sales engineer and welding specification writer. Resourceful, dependable. Desires engineering or teaching position. Salary and location open. Available immediately. C-8904.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 26; single; B.S.C.E., Duke University, 1933. Majored structural steel design and water supply; 1 month with U. S. Coast and Geodetic Survey; 3 months experience, water and sewage works; 3 years as inspector of telephone apparatus. Desires opportunity in any branch of civil engineering. Location immaterial. Available immediately. D-2683.

GRADUATE CIVIL ENGINEER; Jun. Am. Soc. C.E.; 28; married; B.S. in C.E., University of Michigan, 1928; 4½ years experience drafting, computing, and estimating in railroad engineering office; desires work in any branch of civil engineering. Available immediately. D-2119.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; single; 29; B.S.C.E., University of Minnesota; licensed civil engineer and land surveyor; 3 years on municipal and land subdivision surveys; 6 months in railroad division office, field surveys; 3 years with U. S. Engineers on river channel and flowage surveys; dam construction inspection; 3½ years on highway materials and concrete pavement inspection and as field officeman on grading projects. D-3007.

HONOR GRADUATE, 1933, Jun. Am. Soc. C.E.; B.S. in C.E.; 21; single; ambitious; resourceful; 6 months general engineering practice, field and office, surveyor, computer, researcher, analyst. Anxious to locate with consulting engineering firm where ability and willingness to work count. Ready at once. Location and salary secondary. D-3022.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 26; married; B.S. in C.E., Duke University, 1933; 1 month on map drafting; 1 month on distillery drafting. Desires opportunity in any branch of civil engineering. Available immediately. D-3025.

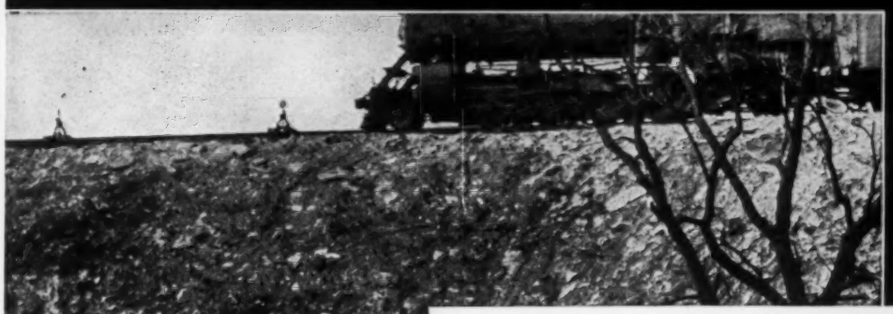
CIVIL ENGINEER; Jun. Am. Soc. C.E.; B.S. in C.E., Yale University, 1933; age 22; single; 4 months experience as instrumentman in U. S. Coast and Geodetic Survey project under CWA. Desires opportunity in any branch of civil engineering. Salary secondary; location immaterial; available immediately. D-3058.

Teaching

CIVIL ENGINEER; M. Am. Soc. C.E.; A.P.E.E.; Methodist Church; Masonic Lodge; Degrees B.S., C.E., M.S. (major structural; minor highway); age 43; 5 years practical experience; 13 years successful teaching (one location), including 9 years as city engineer. Desires position teaching civil engineering or applied mechanics, or position with consulting engineer. D-302.

HIGHWAY AND MATERIALS ENGINEER; M. Am. Soc. C.E.; 42; married; B.S. in C.E., M.S. in highway engineering from leading universities; 4 years teaching experience, ranking as assistant professor, associate professor, and professor of highway engineering; 14 years in private practice as consultant. Desires teaching position. C-4224.

TONCAN SECTIONAL PLATE PIPE



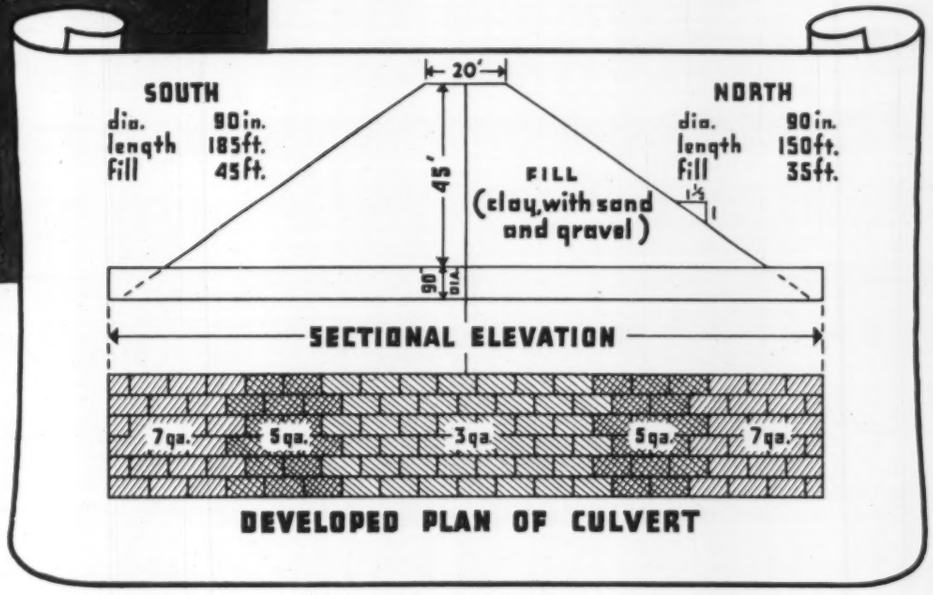
placed under 45-foot fill . .

When the Midland Electric Coal Company was faced with the problem of providing stream drainage near their strip mine, Farmington, Ill., Toncan Sectional Plate Pipe was selected because of its long life and the economies that such a structure permitted.

Two 90-inch structures were used as shown in the sketch. The fill varied from 35 to 45 feet and provided a 20-foot roadway at the top which carried heavy traffic.

Toncan Sectional Plate Pipe has proved highly satisfactory in dozens of installations where heavy fill is necessary. This pipe is built up at the job from curved corrugated plates of rust-resisting Toncan Iron, each one punched accurately to receive the bolts which fasten adjoining plates together. Erecting time is fast. Unskilled labor can do the work. Only a few standard tools are needed. All this makes it a most economical type of drainage structure—and Toncan Iron assures a long life in service. Write for literature.

TONCAN CULVERT MANUFACTURERS' ASSOCIATION
YOUNGSTOWN, OHIO



CIVIL ENGINEER; Jun. Am. Soc. C.E.; 30; single; B.S. in civil engineering, Pennsylvania State College; majored in city planning and highway engineering; 9 years experience in general construction; experienced instructor and author; public speaker and executive; desires position as instructor, research or executive, in civil engineering. D-2776.

PRODUCTION ENGINEER; Jun. Am. Soc. C.E.; 25; B.S. in C.E.; M.S. in C.E.; Lehigh University; majored in concrete with minor in business administration; 2 years with New Jersey Highway Commission; materials testing experience at the Fritz Engineering Laboratory. Desires position in field of ready-mix concrete, construction, testing, or teaching. D-2874.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 26; married; B.S.C.E., Lafayette College, 1929; M. S., University of Minnesota, 1933; structural detailer 1¼ years; 4 years instructor in surveying and structures, Mid-Western state university; 4 summers practical surveying; 1 summer highway inspection. Desires position teaching structures, surveying, mathematics, or mechanics, or any engineering position. Location immaterial. C-6966.

RECENT BOOKS

New books of interest to civil engineers, donated by the publishers to the Engineering Societies Library, or to the Society's Reading Room, will be found listed here. A comprehensive statement regarding the service which the Library makes available to members is to be found on page 75 of the Year Book for 1934. These notes regarding the books are taken from the books themselves, and this Society is not responsible for them.

AIR CONDITIONING. 2 Vols. By S. R. Lewis. Scranton, Pa., International Textbook Co., 1933. Diagrs., charts, tables, 8 × 5 in., leather, vol. 1, $1.65; vol. 2, $2.

The subject of air conditioning is presented simply and clearly in this work, which avoids complicated mathematics and emphasizes practical methods. The physics of air conditioning, equipment, refrigeration, heat transmission through buildings, piping and duct design, and temperature control are discussed, and a final section deals with the design of air-conditioning systems.

CARNEGIE POCKET COMPANION, 24th edition. Pittsburgh, Carnegie Steel Company, 1934. 524 pp., illus., tables, diagrs., 9 × 6 in., fabricoid.

Information and tables for engineers, designers, and others interested in structural steel problems. This edition, which has been revised and enlarged, contains the profiles and data for sections most suitable for all structural purposes, including bridge, building, car, and ship construction. This edition supersedes and cancels all previous publications of the Carnegie Steel Company on structural sections.

CIVIL ENGINEERING HANDBOOK. By L. C. Urquhart. New York and London, McGraw-Hill Book Co., 1934. 885 pp., illus., diagrs., charts, tables, maps, 9 × 6 in., leather, $5.

The principal purpose of this work is to provide the practicing engineer with a compact, comprehensive book, to which he can refer when confronted with a problem outside a specialized field. Civil engineering is covered in ten sections: surveying, railway and highway engineering, mechanics of materials, hydraulics, stresses in framed structures, steel design, concrete, foundations, sewerage and sewage disposal, water supply and purification. Each section is written by a well-known authority. Much tabular matter usually incorporated in handbooks is omitted, and attention is given especially to fundamental theory. The book is of convenient size and the type is large enough for easy reading.

ENGINEERING SURVEYS. By H. Rubey. New York, Macmillan Co., 1934. 109 pp., illus., diagrs., charts, tables, maps, 8 × 5 in., cloth, $3.

A clear, concise presentation of plane surveying, which covers thoroughly the fundamentals of engineering surveys and explains the use of maps and data, the organization and costs of surveys, etc. The book, written from the viewpoint of the modern engineer and executive, is based on thirty years of practice and teaching.

ENGLISH FOR ENGINEERS. By S. A. Harbarger. 3 ed. New York and London, McGraw-Hill Book Co., 1934. 314 pp., 8 × 5 in., cloth, $2.

The course presented here is designed to give the engineering student a good, practical command of the language for letter writing and for preparing reports and technical articles.

GRUNDRISS DER WILDBACHVERBAUUNG. By G. Strele. Vienna, Julius Springer, 1934. 279 pp., illus., diagrs., charts, tables, 10 × 6 in., cloth, 26 rm.; paper, 24.50 rm.

The first third of this compact text on the control of torrents discusses their characteristics, the causes of erosion, and the influence of vegetation on the behavior of streams. The remainder gives methods for controlling torrents and practical ways of applying such methods. The volume is a useful review of European experience. A good bibliography is included.

HELPS TO SUCCESSFUL CONTRACTING. By H. O. Locher. New York and London, McGraw-Hill Book Co., 1934. 222 pp., charts, 8 × 5 in., cloth, $2.

The general problems that confront the contractor are discussed informally and practically. The relations of the contractor with engineers, subcontractors, and employees, the organization of his staff, methods of bidding, the selection and maintenance of equipment, cost keeping, accident prevention, and other topics are considered.

MECHANICS OF ENGINEERING. By S. D. Chambers. New York, Macmillan Co., 1934. 279 pp., diagrs., 9 × 6 in., cloth, $3.50.

The essentials of statics and kinetics, intended for students of engineering who are acquainted with the elements of the calculus and college physics. Highly symbolized mathematical proofs are avoided, and numerous illustrated examples and problems, based on the necessities of general engineering practice, are given.

MUNICIPAL INDEX, 1933, 10th ed. New York, American City Magazine Corp. 491 pp., illus., maps, tables, 10 × 7 in., leather, $5.

This volume supplies an up-to-date list of city managers, mayors, engineers, water works and street superintendents, and police and fire chiefs in cities of over one hundred thousand population. State highway engineers are also listed, together with statistical and other information on highway construction and maintenance, street cleaning, water supply, sewage disposal, traffic control, parks, playgrounds, etc. Condensed catalogues of materials and equipment are also included.

PROTECTION BY PATENTS OF SCIENTIFIC DISCOVERIES, Report of the Committee on Patents, Copyrights, and Trade Marks. (Occasional Publications of the American Association for the Advancement of Science, No. 1, January 1934. Supplement to SCIENCE, Vol. 79.) By J. Rossman, Chairman, F. G. Cottrell, A. W. Hull, and A. F. Woods. New York, Science Press. 40 pp., 10 × 8 in., paper, 50 cents.

The first part of this report considers the advantages and disadvantages of protecting by patent inventions of industrial and medical value, and the patent policies of universities, the Federal Government, and other institutions. In the second part the committee discusses the desirability of legal protection for scientific discoveries.

REPORT OF THE REINFORCED CONCRETE STRUCTURES COMMITTEE OF THE BUILDING RESEARCH BOARD WITH RECOMMENDATIONS FOR A CODE OF PRACTICE FOR THE USE OF REINFORCED CONCRETE IN BUILDINGS. London, His Majesty's Stationery Office, 1933. 69 pp., diagrs., table, 10 × 6 in., paper, 1s 3d. (Obtainable from the British Library of Information, New York, 41 cents.)

The code of practice presented in this pamphlet has been prepared by a committee representing the Institution of Civil Enginers, the Institution of Structural Engineers, and other professional bodies interested in building, and is intended to be a guide in the preparation of local building codes. The principles that governed the findings of the committee are given, as well as the text of the code.

TATSÄCHLICHER UND GEMESSENER FEINHEITGRAD GESCHLIFFENER FLÄCHEN. (Institut für Schleif- u. Poliertechnik der Technischen Hochschule Braunschweig, Heft 2.) By A. Lindau. Braunschweig, Germany, Friedr. Vieweg & Sohn Akt.-Gesellschaft, 1934. 42 pp., illus., charts, tables, 10 × 7 in., paper, 2.80 rm.

This investigation records the development of a new instrument for determining the roughness of finished surfaces, by means of which accurate numerical values for the degree of fineness can be obtained, instead of merely comparative ones.

TEERSTRASSEN. (Der Neuzeitliche Strassenbau, vol. 5.) By Hentrich and Grossjohann. 2 ed. Halle (Saale), Wilhelm Knapp, 1934. 268 pp., illus., diagrs., tables, 9 × 6 in., paper, 12.40 rm.; bound, 13.80 rm.

The use of tar in highway construction, as practiced in Germany, is described in detail in this volume. The properties of road materials, road machinery, and methods of construction are discussed thoroughly, and there are sections on maintenance and costs.

THE MUNICIPAL YEAR BOOK, 1934. Edited by Clarence E. Ridley and Orin F. Nolting. Chicago, International City Managers' Association, 850 East 58th Street, 1934. 256 pp., tables, 10 × 7 in., cloth, $4.

The first edition of a Year Book of American cities, giving up-to-date information and constructive opinion on the trends in municipal government. Data on the form of government in over 600 cities are presented. These include financial statistics, showing receipts, expenditures, debt service, operation and maintenance, gross and net bonded debts, debts of schools and utilities, and similar items. A directory of city officials is given, and there is a selected list of the more important books, pamphlets, and reports, published in 1933 or early 1934, in each of the fields of municipal activity.

THEORIE UND PRAXIS DER SCHWINGUNGSPRÜFMASCHINEN. By W. Späth. Berlin, Julius Springer, 1934. 98 pp., illus., diagrs., charts, tables, 10 × 7 in., paper, 12 rm.

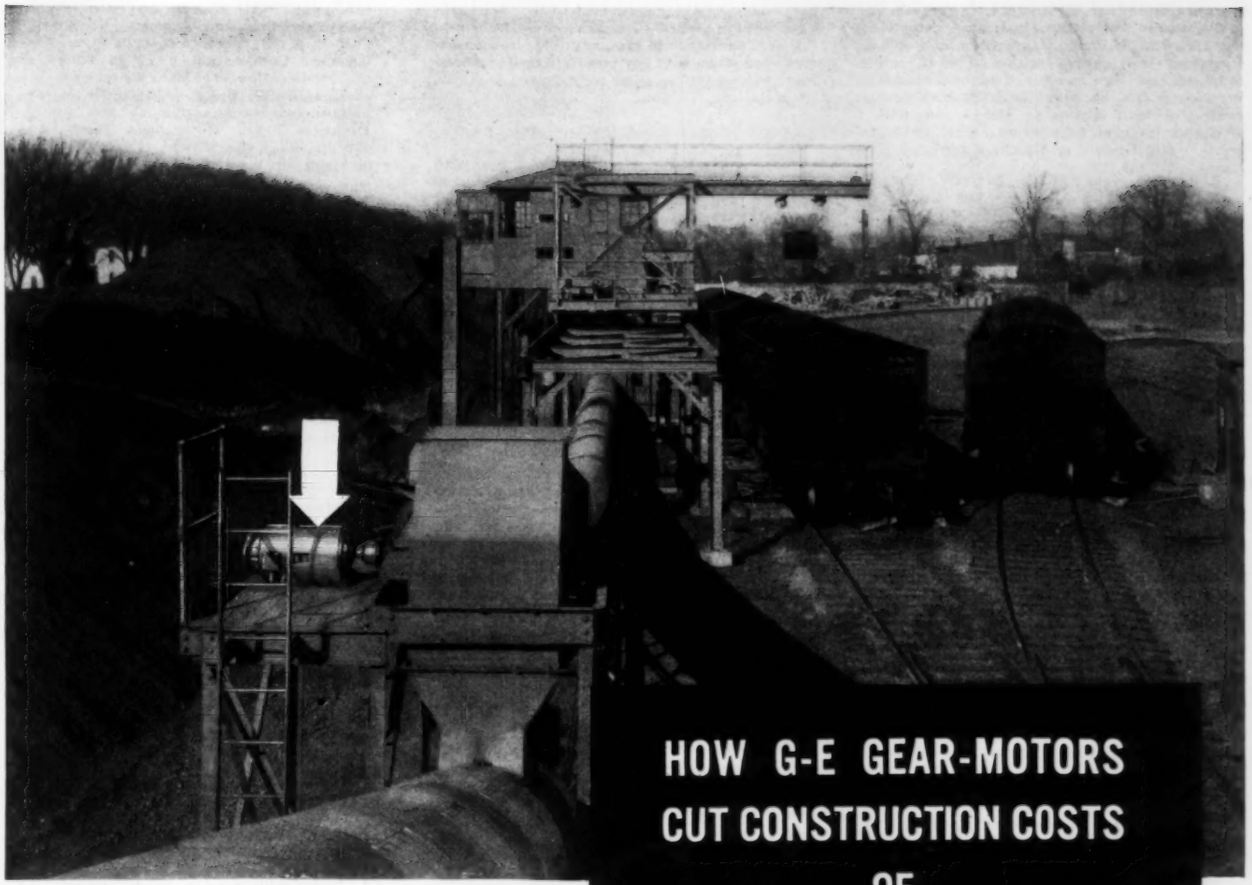
An exhaustive, yet brief account of the various questions connected with the carrying out of vibration tests and evaluation of the results. The first section is devoted to theoretical considerations of vibration, machines for testing, and methods of measuring vibration and of evaluating resonance curves. The second part discusses practical uses of vibration testing, including measurements of bridges, ships, soils, buildings, vehicles, and machinery.

THE CITY-MANAGER PROFESSION. By Clarence E. Ridley and Orin F. Nolting. Chicago, The University of Chicago Press, 1934. 143 pp., tables, diagrs., charts, 8½ × 5½ in., cloth, $1.

Practical, concise data on all aspects of the problem of city managership. Both the academic and practical training of city managers and the necessary qualifications for the position are covered thoroughly. A tabular analysis of city managers is given. These tables show salary changes between 1930 and 1934, division of the managers' time, average length of service, rate of turnover, and other pertinent material. A bibliography is included.

VDI JAHRBUCH 1934. Die Chronik der Technik. Berlin, VDI-Verlag, 1934. 189 pp., 8 × 6 in., paper, 3.50 rm.

This work is intended to supply a systematic account of new developments in engineering and related fields. It contains concise reviews by various specialists, on applied physics, materials, fuels, boilers and firing, hydro-electric and steam plants, transportation, building, refrigeration, lighting, etc., during 1932 and 1933. These are accompanied by extensive references to original papers. The *Jahrbuch* also continues the "chronicle," which formerly appeared in the *VDI-Zeitschrift*.



HOW G-E GEAR-MOTORS CUT CONSTRUCTION COSTS OF THIS CONVEYOR SYSTEM

One of seven G-E gear-motors which operate the coal conveyors of the Buzzard Point Station of the Potomac Electric Company. These motors are all of the splash-proof type, suitable for outdoor installation.

"SHALL we equip this conveyor system with countershaft drive? With drive by separate motors, couplings, and gear reducers? Or with gear-motor drive?"

These questions confronted engineers of the Stephens-Adamson Manufacturing Company, builders of the conveyor system shown above. Their investigation of these three choices showed conclusively that gear-motors provide the least expensive, as well as the most all-around satisfactory, means of obtaining low-speed drive — the result, they selected G-E gear-motors for the job.

The result of selecting gear-motors was twofold. They reduced construction costs by a considerable margin, and at the same time supplied the Potomac Electric Company with conveyor drives that are compact, efficient, and simple.

Specifications for this job, which was engineered by Stone and Webster, required that the drives be suitable for service under all outdoor conditions and that they comply with the safety laws of the District of Columbia. G-E gear-motors, in splash-proof housings, met these requirements.

You will find that its compactness, efficiency, ease of mounting, and simplicity make the G-E gear-motor the preferred drive wherever low speed is desired. For additional information, address General Electric, Department 6D-201, Schenectady, N. Y.

020-57

GENERAL ELECTRIC

CIVIL ENGINEER; M. Am. Soc. C.E.; graduate of Rensselaer Polytechnic Institute; with wide experience in designing, fabricating, and selling structural steel; desires position selling the latter or machinery. Is a member of national engineering societies and has many acquaintances among contractors and engineers. Has a comprehensive knowledge of engineering, sales, and contracts. Mid-Eastern or Southern territory preferred. C-7790.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 30; single; B.S. in civil engineering, Pennsylvania State College; majored in city planning and highway engineering; 9 years experience in general construction; experienced instructor and author, public speaker and executive; desires position as instructor, research or executive in civil engineering. D-2776.

JUNIOR

CIVIL ENGINEERING. Received degree this year. Desires to obtain a position in any branch of civil engineering. Would prefer to work in New York, but will seriously consider any position in any other part of the United States. Salary desired is small. D-3088.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; B.S. in C.E., Yale University, 1933; age 22; single; 4 months experience as instrumentman in U. S. Coast and Geodetic Survey project under the CWA. Desires opportunity in any branch of civil engineering. Salary secondary. Location immaterial. Available immediately. D-3058.

CORNELL GRADUATE; C.E., 1934, with excellent scholastic record, desires position with reliable engineering firm. Age 20 years; American parents; good health and physique. Has had work in economics and accounting along with regular civil engineering courses. D-3166.

CONSTRUCTION ENGINEER desires position with an engineering, construction, and, or business firm. Graduate of Massachusetts Institute of Technology in the Course of Building Engineering and Construction. Previous foreman and general experience on small projects, factories. Will accept field or office job. Any location. Fair salary. D-3092.

JUNIOR CIVIL ENGINEER; Jun. Am. Soc. C.E.; 27; single; M.S. in C.E., University of Minnesota; 2 years experience in university research and instruction. Desires teaching position or work in any branch of civil engineering. Location immaterial. Available immediately. D-2090.

ENGINEER; M. Am. Soc. C.E.; member A.C.I. and W.S.E.; married; degrees B.C.E. and M.S. (Hon.). Extensive experience in design of steel and reinforced concrete structures. Consulting engineer for several years. Taught structural, highway, and municipal engineering in state university, 1933–1934. Desires position as professor of structural engineering. C-1824.

FORMER PRINCIPAL ASSISTANT to distinguished consulting engineer desires teaching position; Assoc. M. Am. Soc. C.E.; offers unusual background of responsible charge of some of the most difficult and interesting tunnel, subway, and underpinning work ever undertaken; author of technical papers; B.S. in E., Princeton University, 1926; New York State license. C-9232.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; married; no children; 25; A.B., Western Maryland College; B.E. in C.E., Johns Hopkins University; 3 years experience as highway construction engineer, acting as resident engineer in charge of bituminous and concrete surfacing and reinforced concrete bridges. Location, immaterial. D-2777.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; B.S. in C.E.; medal for C.E. at Manhattan College, 1932; C.E., 1933; 1 year in distribution department of gas company; 2 summers with surveyor and engineer; 2 years as private tutor. Desires engineering, surveying, or teaching position. D-2893.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; age 23; single; Protestant; C.E. degree, Cornell University, 1933; knowledge of testing and sampling of highway materials; good draftsman; 4 months experience in general engineering practice, in field for large construction company. Desires permanent connection with any branch of civil engineering. Salary and location secondary. Available immediately. D-3066.

TEACHING

ENGINEER; Assoc. M. Am. Soc. C.E.; with broad experience in structural design, reinforced concrete, and building construction, and recent successful teaching experience in an engineering school of first rank; desires responsible position in teaching structural engineering, reinforced concrete, building construction, materials of construction, specification writing. Real interest in teaching; excellent references. D-3135.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 21; single; B.S. and M.S. in C.E., Georgia School of Technology; little experience during summers; teaching or railroad work preferred; good draftsman; salary secondary to chance for advancement; location immaterial. D-2202.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 27; single; B.S. in C.E. from University of Tennessee; has done all of work for master's degree except thesis; member of Phi Kappa Phi and Tau Beta Pi; 2 years experience in location and construction, and 1 year teaching. Any position acceptable; location immaterial. D-2113.

RECENT BOOKS

New books of interest to civil engineers, donated by the publishers to the Engineering Societies Library, or to the Society's Reading Room, will be found listed here. A comprehensive statement regarding the service which the Library makes available to members is to be found on page 75 of the Year Book for 1934. These notes regarding the books are taken from the books themselves, and this Society is not responsible for them.

DIE ABWASSERREINIGUNG. Einführung zum Verständnis der Kläranlagen für städtische und gewerbliche Abwässer. By H. Bach. Second edition. Munich and Berlin, R. Oldenbourg, 1934. 279 pp., illus., diagrs., charts, tables, 9 × 6 in., cloth, 11 rm.

A practical manual on the operation of sewage settling tanks, intended for the instruction of plant attendants who have had no scientific training. The principles of sewage purification are explained in simple language, and the operation of settling plants is presented practically and in detail. This edition has been brought up to date and considerably enlarged.

COST ACCOUNTING FOR CONTROL. By T. H. Sanders. Second edition. New York and London, McGraw-Hill Book Co., 1934. 517 pp., charts, tables, 9 × 6 in., cloth, $4.

A revised and enlarged edition of the author's *Industrial Accounting*, brought up to date and in line with the new problems introduced by government control of industry. As in the previous work, emphasis is on the meaning of costs and their uses in management, rather than on matters of technical procedure.

DESIGN OF MACHINE ELEMENTS. By V. M. Faires. New York, Macmillan Co., 1934. 468 pp., illus., diagrs., charts, tables, $4.

Although the conventional method of grouping materials is followed generally in this text, those elements of machines which can be designed without using the more complicated theories of strength of materials are presented at the outset and the chapters then advance to more difficult work. The subject can thus be studied before the subject of strength of materials, or concurrently with it.

ELASTICITY, STRUCTURE, AND STRENGTH OF MATERIALS USED IN ENGINEERING CONSTRUCTION. Developed by the Geometry of Strain and the Energy Function Through Thermodynamic and Chemical Equations in Such Wise that Strength May Be Figured from Chemical Composition of Rolled Metals and the Modification of This Resistance by Mechanical Work. By C. A. P. Turner, privately published by the author at 300 Builders' Exchange Bldg., Minneapolis, Minn., 1934. 416 pp., illus., diagrs., charts, tables, 10 × 6 in., cloth, $6.

The conclusions that Dr. Turner has drawn from many years' study of the theory of resistance are indicated by the title of this book, in which his matured views are presented in detail. Considerable sections of his earlier book, *Elasticity and Strength of Materials*, reappear in this one but the theoretical framework has been further developed.

ENGINEERING DRAFTING. By W. G. Smith. New York and London, McGraw-Hill Book Co., 1934. 236 pp., illus., diagrs., tables, 9 × 6 in., cloth, $2.25.

A course for the beginner which aims to develop, in addition to skill as a draftsman, independent thinking and initiative. Part one presents the fundamentals of the subject; part two, its applications to machine, airplane, and pictorial drafting.

HIGHWAY ENGINEERING, A TEXTBOOK FOR STUDENTS OF CIVIL ENGINEERING. By J. H. Bateman. Second edition. New York, John Wiley and Sons, 1934. 441 pp., illus., diagrs., charts, tables, 10 × 6 in., cloth, $4.

This textbook aims to present the fundamental principles of the theory of highway engineering, with a comprehensive description of present practice, and is intended as a textbook for an undergraduate course. Economics, financing, location, design, construction, maintenance, and operation are discussed. This edition has been revised and enlarged.

MATHEMATICAL TABLES, reprinted from Searles' and Ives's *Field Engineering*, with additions. Compiled and arranged by H. C. Ives. Second edition. New York, John Wiley and Sons, 1934. 160 pp., diagrs., tables, 7 × 4 in., leather, $1.50.

A collection of the mathematical tables most frequently needed is presented in a volume small enough to be carried easily in the pocket. The type is clear, and great care has been taken to insure accuracy. The new edition has been enlarged to include 18 tables, instead of 14.

MITTEILUNGEN AUS DEN FORSCHUNGSANSTALTEN, Bd. 3, Heft 2, June 1934, pp. 29–50. Berlin, VDI-Verlag, illus., charts, diagrs., 12 × 8 in., paper, 2.45 rm.

This pamphlet contains the following three reports from the research laboratories of industrial concerns: the influence of transverse boreholes on the fatigue resistance of chrom-molybdenum steel; combustion phenomena in iron heating stoves: and the erection of the Save River suspension bridge at Belgrad.

LE POMPE CENTRIFUGHE. CALCOLO E COSTRUZIONE. By G. Zappa. Milan, Ulrico Hoepli, 1932. 320 pp., diagrs., charts, tables, 10 × 7 in., paper, 45 lira.

A comprehensive book on the design of centrifugal pumps, in which the hydraulic principles are discussed thoroughly and their application in design is illustrated in detail. The treatment is theoretical and intended for the designer rather than the builder of pumps.

SCIENTIFIC AND TECHNICAL PAPERS. By K. Suyehiro. Compiled and published by the Suyehiro Memorial Committee, Tokyo, 1934. 457 pp., illus., diagrs., charts, tables, 11 × 8 in., cloth.

This handsome memorial to the noted Japanese engineer contains 45 papers by him, reprinted from various periodicals. Dr. Suyehiro was for many years professor of naval architecture and applied mechanics at Tokio and was also director of the Earthquake Research Institute. His research work included studies of the structural strength and rolling and vibration of ships, problems in applied mechanics, and investigations of seismological questions, especially those related to the design of earthquake-resistant structures. With but few exceptions these papers are in English.

What is Linde Process Service?

Linde men on the firing line exemplify and crystalize a service rendered above and beyond the purchase of tangible goods. They are the direct contact in the field. They work closely with users of Linde Oxygen, assist them in training and qualifying operators and help organize the most efficient welding operations. Yet, this is only the visible evidence of what Linde Process Service means. Linked to the army of service operators are the combined efforts of scientists, engineers and metallurgists constantly working toward improvements in welding technique, materials and apparatus.

Back of the service operators come service supervisors, resident engineers, consulting, development and research engineers. Their work is highly important. Hundreds of practical and theoretical problems in metallurgy and in the application of the oxy-acetylene process for pipe line work are constantly studied by these men. The results of these studies enable Linde service operators to give greater service to Linde customers by bringing to their jobs the latest and best pipe line welding methods.

Linde Cooperation Continuous

Linde has a continuing interest in its customers. It exerts every facility to assure them the highest satisfaction and most profitable use of the Linde products they buy. The nearest Linde Sales Office will be glad to tell you how Linde Process Service can be of help to you. Without cost or obligation, it will gladly furnish complete data to users of Linde Oxygen on welding piping methods. It will make available also such further technical assistance your engineers or construction men may require. Linde Sales Offices are located at Atlanta, Baltimore, Birmingham, Boston, Buffalo, Butte, Chicago, Cleveland, Dallas, Denver, Detroit, El Paso, Houston, Indianapolis, Kansas City, Los Angeles, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Phoenix, Pittsburgh, Portland, Ore., St. Louis, Salt Lake City, San Francisco, Seattle, Spokane, and Tulsa. Everything for oxy-acetylene welding and cutting—including Linde Oxygen, Prest-O-Lite Acetylene, Union Carbide and Oxweld Apparatus and Supplies—is available from Linde through 126 producing plants and 859 warehouse stocks.

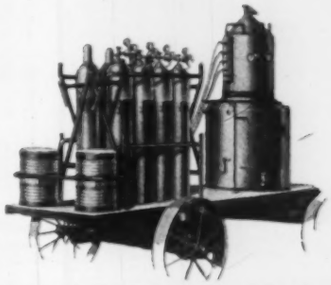
The Linde Air Products Company

Unit of Union Carbide and Carbon Corporation

UCC NRA CODE

In Canada, Dominion Oxygen Co., Ltd., Toronto

You can order everything for Pipe Line Welding from Linde



LINDE OXYGEN . . . available in any amount from plants and warehouse stocks in all industrial centers.

PREST-O-LITE ACETYLENE . . . ready to use—the standard dissolved acetylene for well over a quarter of a century.

OXWELD APPARATUS AND SUPPLIES . . . Oxweld offers the maximum value in oxy-acetylene equipment. Blowpipes, regulators, acetylene generators, welding rods, and supplies—are available for every welding and cutting operation. Complete stocks and service stations are located in all principal cities.

UNION CARBIDE . . . sold in the familiar Blue and Grey drum from over 250 warehouse stocks.

PRODUCT OF A UNIT OF UCC UNION CARBIDE AND CARBON CORPORATION

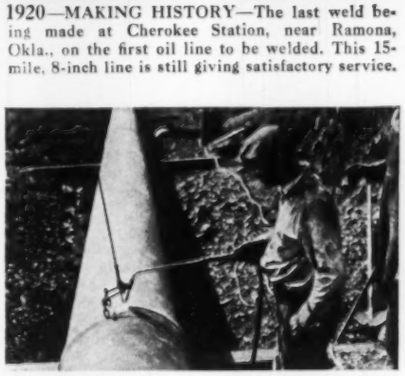
You are cordially invited to visit the welding demonstrations and the numerous other exhibits sponsored by the Corporation in both the Basic and Applied Science sections in the Hall of Science at Chicago's 1934 A Century of Progress Exposition. Here you will see how users of oxy-acetylene welding and cutting, and other products and processes developed by Units of Union Carbide and Carbon Corporation benefit from a most unique coordination of scientific research with manufacturing, sales and service facilities.

· HIGHLIGHTS IN WELDING HISTORY ·

1920—MAKING HISTORY—The last weld being made at Cherokee Station, near Ramona, Okla., on the first oil line to be welded. This 15-mile, 8-inch line is still giving satisfactory service.

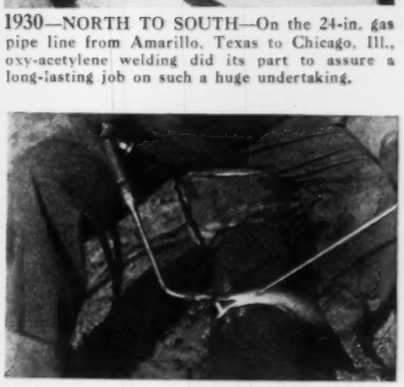
1921—FIRST LONG welded oil pipe line in the United States, 140 miles from Mexia to Hensley, Texas. Today, this line is still on the job and many thousands of miles of welded pipe lines cover the country.

1930—NORTH TO SOUTH—On the 24-in. gas pipe line from Amarillo, Texas to Chicago, Ill., oxy-acetylene welding did its part to assure a long-lasting job on such a huge undertaking.



1931—OVER THE MOUNTAINS—On the longest 26-in. gas line, laid over the mountains between Kettleman Hills and Los Angeles, Lindewelding set a record for fast daily production of sound welded joints.

1934—NEW SPEED RECORDS—At the Tulsa Oil Show this Spring, new speed records in welding were chalked up. With the Multi-Flame Lindewelding Head welds were made in 12-in. standard ¼-in wall pipe in 7½ to 8 minutes.



IN ACTION—Out in the field we see the Multi-Flame Lindewelding Head setting new records for fast production on pipe lines. Better, stronger welds in less time, less material and least cost.

ENGINEER; M. Am. Soc. C.E.; degree B.E. at Union College, 1898; broad professional and executive experience; chief engineer in charge of construction; hydro-electric and steam plants; transmission and distributing systems; president of construction company; consulting engineer, 18 years. East preferred. C-5083.

CIVIL ENGINEER; Assoc. M. Am. Soc. C.E.; 32; Cornell graduate; married; 10 years experience on highway location, design, and construction. Desires position in charge of county highway organization, or with contractor on highway work. Location immaterial. Available on short notice. D-3248.

CIVIL AND STRUCTURAL ENGINEER; Student Member; Associate Member A. S. M. E.; 40; graduate B.S. in C.E.; 12 years experience; mechanical design and supervision of large machinery; surveying, buildings, foundations, highway and railroad design and construction, including New York City subways; survey, docks, wharfage facilities; open and closed sewer systems; consultant, culverts and small bridges; office work, management; materials supervision. B-6639.

GRADUATE ENGINEER; Assoc. M. Am. Soc. C.E.; 36; married; with 13 years varied experience, including sales, purchasing, and consulting; available on short notice as sales engineer, consultant, or for position allied to engineering. B-5822.

ENGINEER-MANAGER; M. Am. Soc. C.E.; 47; married; Pennsylvania state licensed engineer. Over 25 years experience in engineering and sales; also shop and field management. Prefers connection as district representative in Pennsylvania and Ohio or in supervising capacity with a manufacturing industry. C-5095.

JUNIOR

JUNIOR ENGINEER; Jun. Am. Soc. C.E.; single; B.S. in C.E.; 4 years teaching drafting experience. Wish to work as surveyor, draftsman, or clerk for company in the field of design and construction. Also interested in teaching mathematics and drafting. Location United States or South America. D-3211.

JUNIOR ENGINEER; student member; B.S. in engineering and C.E. from Manhattan College. Ambitious and a hard worker. Will go anywhere to work at anything in the engineering profession. D-3250.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; age 24; single; B.S. in C.E., Clarkson College of Technology; M.S., Massachusetts Institute of Technology. Majored in hydraulic model work and structures. Desires opportunity to work or to teach and study civil engineering. Description of experience furnished. Any location. Available in one week. D-3148.

ENGINEER; Jun. Am. Soc. C.E.; 28; C.E. and M.C.E., Rensselaer Polytechnic Institute; neat, ambitious, and responsible; 5 years teaching experience, 5 months surveying field work; 4 months office work, 1 month compilation of aerial map. Desirous of obtaining position with a future in technical, industrial, or business firm. D-3043.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 27; B.E.C.E., Johns Hopkins University, 1930; 1 year in railroad office, estimating, structural drafting, checking, and construction accounting; 1 year as field engineer for contractor on bridge construction; 6 months surveying; 2 months with U. S. Engineers on dredging work. Desires position in any branch of civil engineering. Location immaterial. D-1191.

CIVIL ENGINEER; student member; 25; single; C.E. degree from Rensselaer Polytechnic Institute, 1934; experience in drafting, surveying, design of small-type steel bridges, trusses, and concrete buildings; desires position in any branch of civil engineering. Available immediately. Salary and location secondary. D-3223.

CIVIL ENGINEER, Jun. Am. Soc. C.E.; B.S. in Architectural Engineering, Massachusetts Institute of Technology, 1932; age 23; single; 1 year of general engineering experience in structural steel and reinforced concrete design; 7 months as assistant engineer with the CWA in survey work; field or office; desires experience; salary secondary. D-3285.

CIVIL ENGINEER, Jun. Am. Soc. C.E.; 23; B.C.E., Polytechnic Institute of Brooklyn, 1933; three years experience in metal layout and design; one year in surveying; eight months training in engineering statistics and report work on actual job; one year on architectural design of Neon lights; location immaterial; fluent German and Spanish. D-3226.

GRADUATE ENGINEER; Jun. Am. Soc. C.E.; B.S. in C.E., Armour Institute of Technology, 1930; age 25; married. Experience includes surveying, 7 months of teaching, and 3 years of flying as ensign, U.S.N.R.; additional night school work since college. Desires permanent position with chance for advancement. Available immediately. D-3297—5055 Chicago.

TEACHING

CIVIL ENGINEER; Jun. Am. Soc. C.E.; C.E., Brooklyn Polytechnic Institute; B.S., N. Y. State College of Forestry. Experience: construction work, field and office; camp development, both in engineering and forestry details; some research work and reports. Interested in opportunity where both types of education may be used, especially research or teaching. Location immaterial. D-1820.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; 30; single; B.S. in civil engineering, Pennsylvania State College; majored in city planning and highway engineering; 9 years experience, general construction; experienced instructor, author, public speaker, and executive; desires position as instructor, research, or executive work in civil engineering. D-2776.

CIVIL ENGINEER; Jun. Am. Soc. C.E.; with six years responsible experience as a surveyor, draftsman-designer, and instructor in civil engineering subjects; age 27. Graduate, 1928. Mastered in geology. Available immediately in the East. D-3243.

CIVIL ENGINEER; M. Am. Soc. C.E.; S.P.E.E.; Methodist Church; Masonic Lodge; Degrees B.S., C.E., M.S. (major structural; minor highway); age 43; 5 years practical experience; 13 years successful teaching (one location), including 9 years as city engineer. Desires position teaching civil engineering or applied mechanics, or position with consulting engineer. D-302.

RECENT BOOKS

New books of interest to Civil Engineers, donated by the publishers to the Engineering Societies Library, or to the Society's Reading Room, will be found listed here. A comprehensive statement regarding the service which the Library makes available to members is to be found on page 75 of the Year Book for 1934. These notes regarding the books are taken from the books themselves, and this Society is not responsible for them.

BUILDING RESEARCH SPECIAL REPORT NO. 21, SAND-LIME BRICKS. Great Britain Department of Scientific and Industrial Research. By G. E. Bessey. London, His Majesty's Stationery Office, 1934. 62 pp., illus., diagrs., charts, tables, 10 × 6 in., paper, 1s. 3d. (Obtainable from British Library of Information, New York, N.Y., 45 cents.)

This report describes the manufacture of these bricks, their properties, and the methods of testing and analysis. A select bibliography is included. The report contains the information usually wanted by prospective manufacturers and users.

DROSSELKLAPPEN ALS GRUNDABLASSVERSCHLUSSE UNTER BESONDERER BERUCKSICHTIGUNG DER KAVITATIONSGEFAHR. By O. Jüngling. Munich and Berlin, R. Oldenbourg, 1934. 51 pp., illus., diagrs., charts, tables, 11 × 8 in., paper, 4.50 rm.

This report is concerned with the redesign of the butterfly valve so that cavitation will be avoided and the valve made suitable as a discharge valve for dams. The advantages and disadvantages of the valve, the danger of cavitation and its relation to design are discussed, and improved methods of design are presented.

EL TRAFICO EN BUENOS AIRES, RED DE VIAS A BAJO NIVEL, SOLUCION DE PROBLEMAS URBANOS. By P. Palazzo. Buenos Aires, Argentina, the author, Calle Rivadania 4296, 1933. 88 pp., illus., 9 × 7 in., paper, no price given.

The author proposes as a solution of the difficult traffic problem of Buenos Aires, a system of two-level avenues through the center of the city. The advantages of this plan over a subway system are discussed. Attention is also given to costs, methods of financing, etc.

PIPE-LINE FLOW FACTOR IN THE HYDRAULIC FLOW FORMULA $\left(h = \frac{1}{v}\frac{v^2}{2g}\right)$ AND ITS RELATION TO DENSITY AND VISCOSITY. By F. M. Towl. New York, N.Y., Published by the author at 26 Broadway, 1934. 52 pp., diagrs., charts, tables, 9 × 6 in., cloth. Free while supply lasts.

This paper is intended to simplify the work of engineers interested in the transportation of fluids through pipe lines. The author discusses the coefficient of flow and its relations to steady flow through cylindrical pipes and to the Reynolds number. A slightly modified form of the flow formula is suggested, from which tables or curves that simplify the solution of pipe-line problems can be constructed. The practical applications of the modified formula are illustrated.

RAILWAYS AND ROADS IN PIONEER DEVELOPMENT OVERSEAS. By J. Edwin Holmstrom. London, P. S. King and Son, Ltd., 1934. 304 pp., illus., tables, diagrs., charts, 9 × 6 in., cloth, 15 s.

A practical compilation of original data from Asia, Africa, and other foreign countries on railway and road transportation problems. Such items as capital, renewals, and maintenance and operating costs of both way and works have been considered. Statistics on the trucks and automobiles in use in the various countries and on the cost of building roads and of transportation are presented. Special problems are also considered. The volume will be very valuable to those engaged in the development of transportation in foreign countries.

REPORT OF THE WATER POLLUTION RESEARCH BOARD FOR THE YEAR ENDED JUNE 30, 1933, WITH REPORT OF THE DIRECTOR OF WATER POLLUTION RESEARCH. Great Britain Department of Scientific and Industrial Research. London, His Majesty's Stationery Office, 1934. 50 pp., tables, 10 × 6 in., 1s. 0d. (Obtainable from British Library of Information, New York, N.Y., 35 cents.)

The investigations carried on during the year have been concerned with the following: purification of effluents from beet-sugar and milk factories; the biological oxidation of aqueous suspensions of wood pulp; a chemical and biological survey of the river Tees; the zeolite process of water softening; the contamination of water by lead; the activated sludge process of sewage treatment; the colloids in sewage and beet-sugar factory effluents; and the purification of gas-works effluents.

THE SCIENCE OF WORK. By Morris S. Viteles. New York, W. W. Norton and Company, Inc., 1934. 442 pp., illus., diagrs., charts, 9 × 6 in., cloth, $4.

This volume is an interesting study of how to make work a happier and more productive activity. It is intended to promote a better understanding of the mental aspects of efficiency and adjustment in modern industry, and it deals with the psychological and economic factors that must be considered in the stabilization of industrial civilization. This material has been selected with respect to its practical value and should be helpful to vocational counselors, employment officers, directors of placement bureaus, and economists.

CURRENT PERIODICAL LITERATURE

Abstracts of Articles on Civil Engineering Subjects from Magazines in This Country and in Foreign Lands

Selected items from the current Civil Engineering Group of the Engineering Index Service, 29 West 39th Street, New York, N.Y. Every article indexed is on file in The Engineering Societies Library, one of the leading technical libraries of the world. Some 2,000 technical publications from 40 countries in 20 languages are received by the Library and are read, abstracted, and indexed by trained engineers. With the information given in the items which follow, you may obtain the article from your own file, from your local library, or direct from the publisher. Photoprints will be supplied by this library at the cost of reproduction, 25 cents per page, plus postage, or technical translations of the complete text may be obtained at cost.

BRIDGES

BASCULE, RECONSTRUCTION. Seattle Remodels Its University Bridge, J. A. Dunford. *Eng. News-Rec.*, vol. 111, no. 15, Oct. 12, 1933, pp. 439 and 440. Replacement of timber trestles, with wider permanent approaches, providing two extra traffic lanes outside old bascule trusses and utilizing shop-welded cantilever girders for supports; steel-mesh flooring installed; total cost of remodeling $612,196.

CONCRETE. Bridge Types and Choice of Type, A. W. Legat. *Concrete and Constr. Eng.*, vol. 28, no. 10, Oct. 1933, pp. 565–588. Comparative study of 13 bridge types available; subfoundation; length of bridge; loads, width, and contour; appearance; examples.

ITALY. Il ponte di legno sul "Canal Grande" a Venezia, E. Miozzi. *Annali dei Lavori Publici*, vol. 71, no. 5, May 1933, pp. 431–442, 1 supp. plate. Design and construction of wooden-truss arch bridge, 50 m in span, over Canal Grande in Venice, Italy.

LIGHTING. Winnipeg Structure Embodies Latest Ideas in Bridge Lighting, H. B. Chipman. *Elec. News*, vol. 42, no. 20, Oct. 15, 1933, p. 33. Winnipeg's latest bridge-lighting installation, on new Salter Street viaduct; series system employed.

MONTANA. Continuous Truss Utilized for Missouri River Bridge, W. Bertwell. *Eng. News-Rec.*, vol. 111, no. 17, Oct. 26, 1933, pp. 498 and 499. Description of 3-span continuous-truss bridge, 45-ft long, over the Missouri River, north of Helena, Mont., built by the Montana State Highway Department, showing close agreement between reactions that are obtained by calculations and by field-weighing with jacks; cost data.

RAILROAD CROSSINGS, ELIMINATION. Speed and Bridge Design Feature Grade Separation Project. *Ry. Age*, vol. 95, no. 14, Sept. 30, 1933, pp. 461–464. Delaware, Lackawanna and Western completed large grade-crossing elimination project, eliminating 12 street crossings, in Elmira, N.Y.; girderless, flat-slab bridge structures saved approximately 100,000 cu yd of grading.

STEEL, CONTINUOUS GIRDER. Economy Through Continuity in Girder-Beam Bridges, J. Sorkin. *Eng. New-Rec.*, vol. 111, no. 17, Oct. 26, 1933, pp. 496–498. Summary of design formulas and diagrams, used by the Nebraska Department of Roads and Irrigation in the design of continuous steel girder bridges, which proved economical for 3-span structures more than 120 ft long.

SUSPENSION, SAN FRANCISCO-OAKLAND. Bay Bridge Progress at San Francisco. *Eng. News-Rec.*, vol. 111, no. 16, Oct. 19, 1933, pp. 464–466. Progress report on $14,000,000 bridge over San Francisco Bay; foundation work actively under way as preliminary operations are concluded; working platforms ready at several pier sites; first caisson landed; San Francisco anchorage site ready for concrete.

WOODEN, CONCRETE DECK. Loading Tests on New Composite Type Short Span Highway Bridge Combining Concrete and Timber in Flexure. *Ore. State Highway Commission—Highway Department Tech. Bul.*, no. 1, 160 pp., illus., figs. 1932 series of Oregon State Highway Department investigations of type consisting of combination of creosoted timber substructure and stringer system with integrally supported concrete deck; full-sized composite beam tests; field data; temperature effects; timber-treatment experiments; economic analysis.

BUILDINGS

FAILURE. Einsturz eines Neubaues in Budapest, G. V. Kazinczy. *Beton u Eisen*, vol. 32, no. 12, June 20, 1933, pp. 181–183. Description and analysis of causes of the partial collapse of a recently completed 5-story apartment house in Budapest, which caused the loss of 8 lives.

CITY AND REGIONAL PLANNING

GERMANY. Slum Eradication in Hamburg, Germany, R. S. MacElwee. *City Planning*, vol. 9, no. 4, Oct. 1933, pp. 173–180. Review of experience of Hamburg in slum eradication since the cholera outbreak of 1892.

KANSAS CITY, KANS. New Seventh Street Trafficway in Kansas City, Kansas, LaMotte Grover. *Eng. News-Rec.*, vol. 111, no. 16, Oct. 19, 1933, pp. 459–463. Extensive improvement through the heart of the city providing a by-pass around Kansas City, Mo., and including bridges over both the Kansas and Missouri rivers as well as long viaducts over industrial districts; bridge piers founded on steel H-piling.

REGIONAL PLANNING, WISCONSIN. Zoning in Marginal Areas, G. S. Wehrwein. *City Planning*, vol. 9, no. 4, Oct. 1933, pp. 153–163. Regional zoning experience of Oneida County, Wisconsin.

ROADSIDE IMPROVEMENT. Roadside Improvement. *City Planning*, vol. 9, no. 4, Oct. 1933, pp. 181–186. Report of American City Planning Institute Committee on roadside improvement and its relation to city planning, including zoning, legislation, and procedure in dealing with the problem of roadside uses, such as billboards, food stands, barbecues, and other forms of development along highways.

SLUMS. Problem of Slum, C. R. Hutchinson. *Surveyor*, vol. 84, no. 2175, Sept. 29, 1933, pp. 269 and 270. General discussion of the slum problem, with special reference to conditions in the city of Exeter, England. Before Inst. Mun. and County Engrs.

CONCRETE

COAL BUNKERS, CONCRETE. South Brooklyn Coal Pockets Involve Massive Reinforced Concrete, M. Hirschthal. *Concrete*, vol. 41, no. 10, Oct. 1933, pp. 13 and 14. Lackawanna Railroad has built the largest retail coal pocket on the eastern seaboard; track stringers designed as continuous for full 300-ft length; footings continuous in longitudinal direction; structure supported on concrete piles.

CONSTRUCTION, TAMPING. Stampfarbeit und Betondruckfestigkeit. F. Lauser. *Beton u Eisen*, vol. 32, no. 11, June 5, 1933, pp. 171–174. Laboratory tests showing the effect of tamping on the compressive strength of concretes made of three kinds of common and high-grade cement.

DESIGN. Combined Bending and Thrust or Tension, A. G. Boorman. *Concrete and Constr. Eng.*, vol. 28, no. 10, Oct. 1933, pp. 594–602. Theoretical mathematical analysis of stresses in steel reinforcement, including a case where eccentricity is known; example.

SLABS, TESTING. Some Experiments on Reinforced Concrete Slabs, R. H. Squire. *Junior Inst. Engrs.—Journal and Record of Trans.*, vol. 44, part 11, Aug. 1933, pp. 447–457; see also *Quarry and Roadmaking*, vol. 38, no. 443, Oct. 1933, pp. 401–406. Tests of scale models, using homemade testing apparatus.

TEMPERATURE EFFECT. Thermal Properties of Mass Concrete, C. S. Rippon and L. J. Snyder. *Am. Concrete Inst.—Journal*, vol. 5, no. 1, Sept.-Oct. 1933, pp. 35–40. Thermal properties requisite to intelligent prediction of conditions of internal temperature and to rational design and operation of adequate and economical cooling system for Boulder Dam.

TESTING LABORATORIES. Development of Large Calorimeter Rooms and Automatic Temperature Controls for Adiabatic Curing of Mass Concrete, H. S. Meissner. *Am. Concrete Inst.—Journal*, vol. 5, no. 1, Sept.-Oct. 1933, pp. 21–26. Concrete testing laboratory specially designed for study of adiabatic curing of mass concrete in connection with the construction of Boulder Dam.

VIBRATING. Vibration as Means of Placing Concrete. *Am. Concrete Inst.—Journal*, vol. 5, no. 1, Sept.-Oct. 1933, pp. 48–64 (discussion) 65–71. Symposium consisting of the following papers: High Frequency Vibratory Machines for Concrete Placement, M. I. McCarty; Placement of Concrete by Mechanical Vibrations, A. W. Munsell; Vibration on Michigan Bridge Work, A. C. Benkelman; Vibrating Equipment in Cast Stone Plant, G. B. Pickop; Fabricating 36-In. Reinforced Concrete-Steel Cylinder Water Mains, J. F Brett; and Vibration in Making Roof Deck Slabs, A. B. Shenk.

WATERPROOFING. Efficiency of Surface Treatments on Permeability of Concrete, G. W. Washa. *Am. Concrete Inst.—Journal*, vol. 5, no. 1, Sept.-Oct. 1933, pp. 1–8. Report on original tests, made at the Materials Laboratory of the University of Wisconsin, comparing properties of 18 concrete waterproofing compounds in common use.

CONSTRUCTION INDUSTRY

COSTS. Unit Bid Summary. *Western Construction News and Highways Bldr.*, vol. 8, no. 16, Oct. 1933, pp. 432, 434, 436, 438, 440, 442, 444, and supp. p. 42. Unit costs bid on street and road work and bridges and culverts in Washington, Oregon, California, Nevada, and Utah.

DAMS

CONCRETE FACING. Friction of Lubricants for Laminated Concrete, E. C. Eaton. *Eng. News-Rec.*, vol. 111, no. 15, Oct. 12, 1933, pp. 442–444. Friction tests made on a variety of lubricants for use between the laminations of facing for the San Gabriel flood-control dams; preliminary high-pressure friction tests indicating that greater pressure results in lower coefficient.

CONCRETE GRAVITY, GREAT BRITAIN. Ryburn Reservoir. *Engineer*, vol. 156, no. 4054, Sept. 22, 1933, p. 287, figures on p. 284. Dam designed by Clemesha Smith; curved in plan; with a gravity section of concrete, a full height of 129 ft, a length at the top of 6,000 ft, and a width at the base of 84 ft 6 in.; volume of water impounded is 220 million gal.

EARTH, NEW MEXICO. Metal-Faced Gravel Dam Being Built in New Mexico, H. P. Bunger. *Eng. News-Rec.*, vol. 111, no. 17, Oct. 26, 1933, pp. 504 and 505. Features of new gravel-fill, welded metal-faced dam, 170 ft maximum height, now under construction by the Middle Rio Grande Conservancy District in New Mexico.

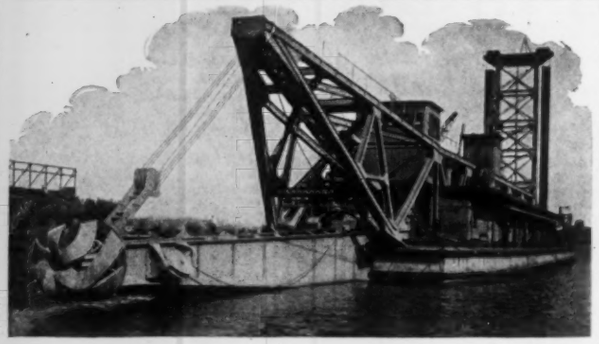
FAILURES. Not a Rock-Fill Dam, M. M. O'Shaughnessy. *Eng. News-Rec.*, vol. 111, no. 16, Oct. 19, 1933, p. 479. Discussion of two articles entitled: Castlewood Dam Failure Floods Denver; and Data on Castlewood Dam Failure and Flood, by J. E. Field, previously indexed from the issues of Aug. 10, and Sept. 7, 1933, respectively.

HYDRAULIC FILL. Drainage in Hydraulic-Fill Dams, J. D. Justin. *Eng. News-Rec.*, vol. 111, no. 15, Oct. 12, 1933, pp. 448 and 449. Discussion of paper entitled: Improved Internal Drainage for Hydraulic-Fill Dams, by E. McD. Moore, previously indexed from the issue of Aug. 24, 1933.

RESERVOIRS, GREAT BRITAIN. Talybont Reservoir Works. *Surveyor*, vol. 84, no. 2178, Oct. 20, 1933, p. 333. Description of recently completed water-supply reservoir, with a capacity of 2,500 million gal, for Newport in South Wales; earth dam is 1,400 ft in length and 97 ft in height.

ROCK-FILL, FAILURE. Failure of Castlewood Rock-Fill Dam, I. E. Houk. *Western Construction News and Highways Bldr.*, vol. 8, no. 15, Sept. 1933, pp. 373–375. History of dam; its failure and probable causes. Bibliography.

WASHINGTON. Cle Elum Dam Completes Storage for Yakima Project, R. J. Newell. *Eng. News-Rec.*, vol. 111, no. 14, Oct. 5, 1933, pp. 397–400. Design and construction of rolled-earth dam, 130 ft high, made up of borrow-pit material rolled in $6\frac{1}{2}$-in. layers to a compaction of 134 lb per cu ft; method of sinking gate shaft 140 ft deep; construction of 19-ft diameter outlet tunnel 1,800 ft long driven through gravel, using steel liner plates; 30-in. lining of reinforced concrete placed inside plates; spillway leads to stilling pool with dentated sill.



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ANY TYPE - ANY SIZE - ANY SERVICE

ELLICOTT MACHINE CORPORATION

BALTIMORE, MARYLAND U.S.A.

Additional head room involved a foundation problem

The original head room in the sub-basement of the seven story building at 47 Ann Street in New York was six feet six inches. Storage facilities were limited.

Head room was increased to ten feet by Spencer, White & Prentis methods. The exterior walls were underpinned, and settlement minimized by Pretesting. The sub-basement was then safely excavated to the new depth, and the new floor laid.

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Kalman Steel Corporation

BARS, REINFORCING
Inland Steel Company

BARGES, STEEL
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BRIDGES
American Bridge Company
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WEIRS, SWITZERLAND. Le barrage d'Albbruck-Dogern sur le Rhin, à la frontière germano-suisse, J. Stutz. *Techniques des Travaux*, vol. 9, no. 7, July 1933, pp. 433–440. Description of open weir, about 22 m high, consisting of five 25-ft bays, built for Albbruck-Dogern hydro-electric power development on Rhine River, at Swiss-German boundary.

FLOOD CONTROL

NEW ZEALAND. Waimakariri River Control, J. Wood. *New Zealand Soc. Civ. Engrs.—Proc., 1932–1933*, vol. 19, 1933, pp. 155–177 (discussion) 177–192, 4 supp. plates. Flood control of river drainage area of 1,000 sq miles, restricting flow to comparatively narrow nearly straight channel; fixation of mouth of river; reforestation of watersheds; regulation of tributaries.

RIVERS, IMPROVEMENTS. New Cut-offs Being Made on Mississippi. *Eng. News-Rec.*, vol. 111, no. 12, Sept. 21, 1933, pp. 358 and 359. Description of river rectification below Greenville Bends to prepare river for changed flow due to cut-offs at Leland and Tarpley Necks, between Arkansas River and Vicksburg; cut-off dikes; developing cut-offs.

FOUNDATIONS

PILES, CONCRETE. Features of Franki System of Piling. *Can. Engr.*, vol. 65, no. 16, Oct. 17, 1933, pp. 12–14. Characteristics of patented Belgian system of concrete pile construction; dry concrete hammered in driving tube is spread at the base and the surrounding soil compacted, giving great supporting power.

TESTING. Soil-Bearing Tests for Columbus Water Tanks, J. C. Prior. *Eng. News-Rec.*, vol. 111, no. 17, Oct. 26, 1933, pp. 500–502. Method of testing foundation soil for two water tanks with capacities of 1,021,000 and 2,004,000 gal in Columbus, Ohio; settlements of test columns and foundations harmonize closely; soil yield-point plainly shown; design of foundations; effect of bearing area upon settlement. Bibliography.

HYDROLOGY, METEOROLOGY, AND SEISMOGRAPHY

ANEMOMETERS. Small Wind Meter, E. O. Hulburt. *Rev. Sci. Instruments*, vol. 4, no. 9, Sept. 1933, pp. 501–503. Rugged, portable, quick-period meter for measuring speed of wind and of gusts of wind; instrument consists essentially of mica vane and pointer twisting torsion wire; illustrations and sketches.

CANALS, SEEPAGE. Formula Developed for Determining Canal Seepage Losses, S. Shulits. *Eng. News-Rec.*, vol. 111, no. 15, Oct. 12, 1933, p. 433. Abstract of paper by R. Dachler, published in *Wasserwirtschaft*, March 25, 1933, p. 110, outlining the method of analyzing seepage from canals by means of conformal transformation, and construction of flow nets.

EARTHQUAKES. Earth Movements, C. P. Stomeyer. *Min. Mag.*, vol. 49, no. 1 and 2, July 1933, pp. 27–30 and Aug. pp. 91–95. Author's theory of earth movements is illustrated by reference to particular areas on earth's crust.

HYDROLOGY. Notes, communications, bibliographie. Conseil Internationale de Recherches Union Geodesique et Geophysique Internationale. *Association International d'Hydrologie Scientifique—Bul.*, no. 19, 115 pp. Collection of papers on the hydrology of glaciers, lakes, hydrological laboratory of Saulcy, etc., by the following authors: H. E. Hurst, L. Gherardelli, Hegly, Kreitmann, E. A. Martel, and Dienert. Bibliography.

ITALY. Il Terremoto del 1930 nell'Italia meridionale e la geotettonica della sua area, C. Crema. *Annali dei Lavori Pubblici*, vol. 71, no. 5, May 1933, pp. 418–430, 1 supp. plate. Study of geomorphological characteristics of region affected by earthquake of July 23, 1930, showing perfect correlation between the distribution of earthquake damage and the geological structure of territory. Bibliography.

NEVADA. Nevada Earthquake of December 20, 1932, V. P. Gianella. *Min. and Met.*, vol. 14, no. 319, July 1933, pp. 300 and 301. Notes on strongest quake centering in Nevada since Pleasant Valley earthquake of October 2, 1915; total affected area about 300 sq miles; most striking features are widespread fracturing and almost total lack of secondary effects due to flowing or lurching soil.

INLAND WATERWAYS

BELGIUM. L'Escaut maritime en aval d'Anvers, M. L. Bonnet. *Annales des Travaux Publics de Belgique*, vol. 34, no. 3, June 1933, pp. 383–418, 1 supp. plate. Hydrology of River Scheldt below port of Antwerp; features of engineering works; description of port of Antwerp, its structures and port facilities.

RIVERS, EROSION CONTROL. Control of River Erosion by Permeable Timber Groynes, T. H. F. Nevins. *Commonwealth Engr.*, vol. 21, no. 2, Sept. 1, 1933, pp. 33–40. Experience of the Public Works Department of Westport, New Zealand; choice of groin type; history of development; theory of action of permeable, boom groins; construction; root protection; willow plantations; maintenance; costs.

IRRIGATION

CALIFORNIA. All-American Canal, H. J. Gault. *Military Engr.*, vol. 25, no. 143, Sept.–Oct. 1933, pp. 379–382. General plan of all-American irrigation canal project to be developed in connection with Boulder Canyon project, for irrigation of Imperial, East Mesa, West Mesa, and Coachella valleys in southeastern California, totaling about 1,000,000 acres; passing cross drainage; exclusion of sand and silt.

HOLLAND. Influence of Closing of Zuyder-Sea on Tidal Regimen along Dutch Coasts, J. T. Thijsse. *Permanent Inst. Assn. Navigation Congress—Bul.*, vol. 8, no. 15, Jan. 1933, pp. 59–82. In studying tides, two different cases have been considered: the first corresponding to the situation before enclosing, and the other corresponding to the present Waddenzee, the boundary there being formed by the enclosure dike.

MEXICO. Sistema de Riego del Canal Rosales, O. Alba. *Irrigacion en Mexico*, vol. 7, no. 2, Aug. 1933, pp. 104–144. Progress report on construction of Rosales irrigation canal on the right bank of the Culiacan River in the State of Sinaloa; separate report by A. Weiss, based on study of technical and economic features, during February and March 1933.

NETHERLANDS. Les travaux de fermeture et d'assechement du Zuyderzée (Pays-Bas). *Génie Civil*, vol. 10 , no. 11, Sept. 9, 1933, pp. 245–249. Article on Zuiderzee land reclamation project, in Holland, particularly enclosure and drainage of Zuilderzee, similar in contents to several previously indexed articles.

SOUTH AFRICA. Views on Irrigation and Water Supply, H. T. Burgers. *South African Inst. Engrs.—Journal*, vol. 32, no. 1, Aug. 1933, pp. 3–13 (discussion) 13–15. Analytical study of conditions and causes leading to the more or less unsuccessful outcome of irrigation projects in South Africa.

UNITED STATES. Operating Problems on Federal Irrigation Projects. G. O. Sanford. *Agric. Eng.*, vol. 14, no. 9, Sept. 1933, pp. 245–247. Achievements of the Government in irrigation; some aspects of the delivery of water to landowners; sources of financing Federal irrigation projects. Before Am. Soc. Agric. Engrs.

LAND RECLAMATION AND DRAINAGE

CULVERTS, CONSTRUCTION. Jacking Corrugated Pipe, L. E. Jones. *Can. Engr.*, vol. 65, no. 14, Oct. 3, 1933, pp. 9 and 10. Description of four successful jobs of jacking "Armco" culverts, 36 to 84 in. in diameter, under highway and railway embankments in Ontario.

TREE PLANTING. Tree Planting to Reclaim Gullied Lands in the South, H. G. Meginnis. *Journal Forestry*, vol. 31, no. 6, Oct. 1933, pp. 649–656 (discussion) 656 and 657. Preparation of site; species and planting material; relative cost of planting gullied land; comparative survival of various sizes of black locust and shortleaf and loblolly pine planting stock during first growing season. Before Assn. of Southern Agric. Workers.

PORTS AND MARITIME STRUCTURES

JETTIES, FLORIDA. Steel Sheetpile Jetty at Pensacola, E. K. Foster and D. E. Young. *Eng. News-Rec.*, vol. 111, no. 17, Oct. 26, 1933, pp. 489–491. Use of steel sheeting in two ways for 1,300-ft jetty to prevent shoaling in Pensacola Bay, Fla., a link in the intracoastal waterway; cost data.

LE VERDON, FRANCE. Ocean Port of Le Verdon. *Engineer*, vol. 156, no. 4051, Sept. 1, 1933, pp. 203–205 and 210. New mole and harbor station at mouth of River Gironde designed as ocean port for Bordeaux; main work begun in 1929 by construction of viaduct leading to mole, carried on two lines of piles; viaduct has width of 17.80 m, and is carried upon two rows of piers; like mole, it is divided into sections to allow for expansion; accommodation for berthing liners by provision of maritime station, 140 m long, constructed upon mole.

MESSINA, ITALY. Il porto di Messina nel quadro nazionale e mediterraneo, G. Gregorio. *Ingegnere*, vol. 7, no. 9, Sept. 1933, pp. 646–653. Description of the Port of Messina, its significance in Italian and Mediterranean commerce; statistical data on port traffic; port facilities; military importance and industrial possibilities.

NAVIGATION, BIBLIOGRAPHY. Rivers, Canals, and Ports. Permanent International Association of Navigation Congresses—Bibliographic Notes. Brussels, Etablissements d'Imprimerie "l'Avenir," Sixth Series, 1932, 286 pp. International bibliography on hydraulic engineering, inland and marine navigation, rivers and sea ports, irrigation and drainage, and similar items, covering period, 1926–1931, inclusive; geographic and author indexes.

QUAY WALLS. Note sur les ouvrages d'accostage exécutés a Rouen, au cours des dix dernières années, P. J. M. Renaud. *Annales des Ponts et Chaussees (Partie Technique)*, vol. 2, no. 4, July-Aug. 1933, pp. 5–26. Improvements in design and construction of so-called "classical" quay walls of the Rouen type, specially adapted for pile foundations; modifications of original type in other estuary ports of France.

SHORE PROTECTION. Sea Defences and Reclamation of Land from Sea, M. Du-Plat-Taylor. *Engineering*, vol. 136, no. 3533, Sept. 29, 1933, pp. 372–374. Consideration of protection of lands against inroads of sea; reclamation of lands from sea. Before Sec. G. Brit. Assn.

SLIPWAYS, TURNTABLE. Marine Railway and Turntable. *Motorship*, vol. 18, no. 8, Aug. 1933, pp. 376 and 377. Turntable at port of Lorient-Keroman, Brittany, capable of tilting, in addition to revolving, enabling vessels on their cradles to be run off inclined slip on to ten horizontal radial berths arranged around turntable. Similar description previously indexed from *Engineering*, May 26, 1933, and June 9, 1933.

STEAM POWER PLANTS, GREAT BRITAIN. Operating Results of Clarence Dock Station, Liverpool. *Engineering*, vol. 136, no. 3528, Aug. 25, 1933, pp. 198–200. Results during 1932, and first 6 months of 1933, of station, which is unique in being built on floor of disused dock; designed for ultimate capacity of 400,000 kw. For references to description of power plant, see Engineering Index 1931, pp. 1352 and 1353.

UNITED STATES. Port Development on Great Lakes, E. M. Markham. *Can. Engr.*, vol. 65, no. 15, Oct. 10, 1933, pp. 15–18. Outline of engineering problems involved in the construction of Great Lakes ports for the accommodation of traffic through the proposed St. Lawrence Shipway and Lakes to Gulf Waterway. Before Am. Assn. Port Authorities.

ROADS AND STREETS

BITUMINOUS. Road-Tar Consistency Conversion Chart, E. O. Rhodes. *Eng. News-Rec.*, vol. 111, no. 16, Oct. 19, 1933, pp. 474 and 475. Conversion curves determined by tests showing the relationship of road-tar consistencies as given by different methods; examples.

CONCRETE. Effect of Vibration and Delayed Finishing on Pavement Slabs, F. H. Jackson and W. F. Kellermann. *Pub. Roads*, vol. 14, no. 8, Oct. 1933, pp. 129–156. Development of methods for using drier mixes in concrete road slabs; use of vibratory screeds; moving excess water from concrete after it was deposited; aggregate combinations; coarse versus fine sand; relation between workability and slump; tendency to honeycomb in valley between batches; effect of delayed finishing (Johnson method); increasing strength and density of concrete.

CONSTRUCTION. Paving Through Blow Sand. *Contractors and Engrs. Monthly*, vol. 27, no. 4, Oct. 1933, pp. 11–13. Construction of concrete road 3.88 miles long, and 20 ft wide in the dune country along Lake Michigan, near Ludington, Mich.; successful use of gasoline locomotives and industrial railway equipment; pouring and curing of concrete slabs.

GERMANY. Strassenbau. *VDI Zeit*, vol. 77, no. 38, Sept. 23, 1933, pp. 1021–1056. Symposium reviewing German practice on planning of highway systems, organization of highway construction and maintenance for relief of unemployment, design and construction of roads and streets, testing of pavements, etc.; symposium consists of papers by the following authors: W. Bloecker, H. Ehlgoetz, F. Platzmann, E. Neumann, J. Kluge, G. Garbotz, E. Weisse, and E. Gerlach.

GRAVEL. Stabilizing Gravel Roads, Onondaga County, N.Y. *Eng. News-Rec.*, vol. 111, no. 18, Nov. 2, 1933, pp. 529 and 530. Construction and maintenance of 285 miles of gravel surface roads bound with calcium chloride; moisture regulation by calcium chloride in stabilized mixtures of local soils; theory of stabilization; results of calcium chloride tests.

HIGHWAY LIGHTING. Street Lighting by Electricity in Irish Free State, F. X. Algar. *Surveyor*, vol. 84, no. 2174, Sept. 22, 1933, pp. 245 and 246. Standardization of materials; public lighting proposals; typical street-lighting installation; esthetic considerations; contracts and charges.

LOW COST. Roller Compacted Concrete Pavements, M. G. Dempster. *Commonwealth Engr.*, vol. 21, no. 1, Aug. 1, 1933, pp. 26 and 27. Discussion of paper entitled: Roller-Compacted Pavement Shows Economy, by G. W. Langley, Jr., previously indexed from *Eng. News-Rec.* April 6, 1933.

MACADAM. Penetration Macadam at Low Cost, R. W. Coburn. *Boston Soc. Civ. Engrs.—Journal*, vol. 20, no. 8, Oct. 1933, pp. 171–181. History of bituminous macadam roads; construction of standard type; materials; machinery and equipment; inspection; proper season for good penetration; bituminous macadam for resurfacing; cost of work; experimental road; bituminous macadam on stone fill; 2½-in. penetration on gravel base.

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NEW YORK. Parkway Systems Through Borough of Queens, Connecting Long Island State Parkways with Manhattan, Bronx, and Brooklyn, C. U. Powell. *Mun. Engrs. Journal*, vol. 19, Second Quarterly Issue paper, no. 169, 1933, pp. 73–84 (discussion) 84–90. General layout of system and history of its development.

PENNSYLVANIA. Effective Low-Cost Road Policy—Pennsylvania's Successful Experience, S. Eckels. *Eng. and Contract. Rec.*, vol. 47, no. 41, Oct. 11, 1933, pp. 961–965. Administration of Pennsylvania's rural road system, composed of 20,000 miles of former township roads; superiority of state administration; Pennsylvania's study of road situation; initiation of new program; reorganization to meet new requirements construction practice.

RAILROAD CROSSINGS, ELIMINATION. Depresses Tracks Formerly Elevated to Eliminate Grade Crossings. *Ry. Age*, vol. 96, no. 11, Sept. 9, 1933, pp. 359–362. Unusual grade separation project completed at St. Louis, by Wabash at a cost of $700,000; involved more than 16 acres of sodding and the replacement of an 80-ft subway with an overhead bridge; map and profile of grade-separation territory.

SIDEWALKS. Footways on Country Roads. *Surveyor*, vol. 84, no. 2174, Sept. 22, 1933, p. 243. Defects of construction and maintenance; suggestions as to new construction and measures of maintenance.

SNOW REMOVAL. How Ontario Organizes for Snow Removal from Public Highways, W. L. Saunders. *Eng. and Contract Rec.*, vol. 47, no. 45, Nov. 8, 1933, pp. 1031, 1033, 1035, and 1037. Accommodating sleigh and motor traffic; highway department requirements; ice conditions.

STREET LIGHTING, GREAT BRITAIN. Association of Public Lighting Engineers. *Roads and Road Construction*, vol. 11, no. 129, Sept. 1, 1933, p. 2789. Program of annual conference and description of lighting equipment to be exhibited at Margate.

SUDAN. Roads in the Sudan, F. T. Murray *Roads and Road Construction*, vol. 11, no. 129, Sept. 1, 1933, pp. 283–286. Construction of Juba-Nimule Road in Mongalla Province, Sudan; surveying; training of natives; gradients and formation; consolidation of traffic; bridges; total cost about $300,000.

SEWERAGE AND SEWAGE DISPOSAL

AERATION. Sewage Aeration by Diffused Air, F. C. Roe. *Sewage Works Journal*, vol. 5, no. 5, Sept. 1933, pp. 813–823 (discussion) 823–825. Progress in sewage aeration; features and development of air-diffuser mediums, which are employed; chemical methods of treatment; diffuser mediums; required properties. Before New York State Sewage Works Assn.

DIGESTION. Digestion of Solids Between Thermophilic and Non-Thermophilic Range, H. Heukelekian. *Sewage Works Journal*, vol. 5, no. 5, Sept. 1933, pp. 757–762. Experimental study of the progress of digestion between two optimum ranges of temperature; sludge produced at 20 C requires period of adaptation and acclimatization to give most efficient digestion at higher temperatures; ultimate digestion time from batch process does not vary materially in range of temperature between 28 and 42 C. Bibliography.

EDDYSTONE, PA. Sewage Treatment Plant Among Attractive Surroundings, E. Bender. *Am. City*, vol. 48, no. 10, Oct. 1933, pp. 43–45. Description of sewage disposal plant, including pumping station, serving a population of 2,500; special precautions taken against nuisances; architectural treatment of plant and landscaping of surroundings.

EQUIPMENT. Machinery for Dealing with Sewage, H. R. Lupton. *Engineering*, vol. 136, no. 3534, Oct. 6, 1933, pp. 396–398. Equipment for the transport of crude sewage (including storm water); removal of contained matters; mechanism required for manipulation and purification of sewage liquor; transport; digestion and desiccation of sludge; transport and disposal of screenings; disintegration of screenings. Before Sec. G of Brit. Assn. Sept. 11, 1933.

FILTRATION PLANTS, SEDIMENTATION BASINS. Diffusion Baffles for Sedimentation Basins, C. G. Hyde. *Western Construction News and Highways Bldr.*, vol. 8, no. 16, Oct. 1933, p. 413. Features and functions of baffles used by author in his designs for Sacramento, Watsonville, and other sedimentation basins in California.

GREAT BRITAIN. Middlesex Sewerage and Sewage Disposal Scheme, J. D. Watson. *Surveyor*, vol. 84, no. 2178, Oct. 20, 1933, pp. 339–340. Details of scheme designed on the basis of ultimate population of 2,000,000, giving dry-weather flow of 80,000,000 gal and maximum wet-weather flow of not less than 480,000,000 gal per day; intercepting and low-level sewers; purification works; sludge disposal; estimated cost is £4,200,000. Before Royal Sanitary Inst.

HERINGTON, KANS. Sewage-Plant Effluent for Boiler Water. *Eng. News-Rec.*, vol. 111, no. 18, Nov. 2, 1933, pp. 521–523. Design, construction, and costs of new activated sludge plant of Herington, Kans., serving a population of 4,600, which will be liquidated by selling its clear and relatively soft effluents for use in locomotives and shop boilers of the Rock Island Railroad Division located nearby.

INDIA. Problem of Sewage Disposal in India in Light of Nagpur Experiments, G. B. Williams. *Inst. Engrs. (India)—Journal*, vol. 12, July 1933, pp. 35–47 (discussion) 49–57 supp. plates. Treatment of sewage of tropical cities; results of Nagpur experiments on treatment of sewage by bio-aeration.

INDUSTRIAL WASTE. Profits from Trade Wastes, S. T. Powell. *Chem. and Met. Eng.*, vol. 40, no. 7, July 1933, pp. 359–360. Notes based on paper by same author previously indexed from *Am. City*, July and August 1933; examples of stream pollution by pickling liquors from steel mills and pollution by pulp and paper mills, indicating advantages of laboratory control and treatment of waste for recovery of salable products and prevention of stream pollution; estimated operating cost for treatment and recovery of salable products from wastes of various industries.

JAMESTOWN, N.Y. Sewage Treatment at Jamestown, N.Y., L. A. Bergman. *Sewage Works Journal*, vol. 5, no. 5, Sept. 1933, pp. 864–867 (discussion) 867–869. Operation of separate system of sewage disposal serving a population of 45,000. Before New York State Sewage Works Assn.

LAWS AND LEGISLATION. When Sewage Disposal Effects Damage, L. T. Parker. *Mun. Sanitation*, vol. 4, no. 8, Aug. 1933, pp. 272–273 and 277. Review of recent court decisions relating to property damage caused by pollution from sewage; damages and injunction against city; city and private industry liable for water pollution; proving liability is technical; complaining party must prove water pollution; new landowner not entitled to recover damages; polluted water kills fish.

PUMPING PLANTS. Pumping of Sewage and Sludge, C. E. Greene. *Sewage Works Journal*, vol. 5, no. 5, Sept. 1933, pp. 858–863. Review of American experience as to costs and methods of operation of sewage pumping plants. Before New England Sewage Works Assn.

SEWAGE ANALYSIS, BIO-CHEMICAL OXYGEN DEMAND. More About Bio-Chemical Oxygen Demand Determination, E. F. Eldridge. *Sewage Works Journal*, vol. 5, no. 5, Sept. 1933, pp. 788–792. Report on experimental study made at Engineering Experiment Station, Michigan State College; effect of seeding on bio-chemical oxygen demand of lactose and maltose solutions, using various periods of incubation.

SEWER CATCH BASINS, STANDARDS. Zur Normung von Strassenablaeufen, J. Schulze. *Gesundheits-Ingenieur*, vol. 56, no. 31, Aug. 5, 1933, pp. 364–368. Proposed standard designs of sand traps and catch basins for Berlin sewer system.

SEWERS, CONSTRUCTION. Excavating Close to Building Without Underpinning, W. O. Johnson. *Eng. News-Rec.*, vol. 111, no. 13, Sept. 28, 1933, pp. 376 and 377. Sectional method of supporting shallow foundation during construction of South Yonkers, N.Y., intercepting sewer, recently completed by Westchester County Sanitary Sewer Commission; regulator wall buttressed to serve as maintaining wall; arrangement of pits and construction joints in structure.

STREAM POLLUTION. Effect of Sunlight on Dissolved Oxygen in White River, C. K. Calvert. *Sewage Works Journal*, vol. 5, no. 4, July 1933, pp. 685–694. Organic load in the White River below Indianapolis, showing that frequently in bright sunlight, the biologic activity of the river is able to maintain considerable oxygen concentration, but that in the absence of sunlight the oxygen content may be zero.

TOKYO, JAPAN. Sewerage System of Tokyo, Japan, I. W. Mendelsohn. *Pub. Works*, vol. 64, no. 9, Sept. 1933, pp. 27 and 28. Description of sewage treatment plants and first part of sewage scheme to be completed in 1939 at a cost of about $18,000,000; results of research at two experimental activated sludge plants; Tokyo water system.

STRUCTURAL ENGINEERING

ARCHES, DESIGN. Influence Lines for Arches with Tables, W. J. Grabner and J. A. Wise. *Univ. Minnesota—Eng. Experiment Station—Bul.*, no. 9, vol. 36, no. 33, July 29, 1933, 27 pp., supp. plates. Tabulation of ordinates for influence lines for computing reactions and stresses at various points in 2-hinged or hingeless, parabolic arch in which the moment of inertia varies with the secant of slope. Bibliography.

BEAMS, STRESSES. Notes on Combined Stresses in Beams, F. H. Thomas. *Structural Engr.*, vol. 11, (New Series) no. 10, Oct. 1933, pp. 413 and 414. Theoretical mathematical analysis having special reference to design of steel grillages.

BRICK CONSTRUCTION. Interim Report on Bearing Pressures on Brickwork. *Structural Engr.*, vol. 11 (New Series), no. 10, Oct. 1933, pp. 417–421. Photographs showing the appearance of cracks in panels, from front and behind, after failure.

COLUMNS, BUCKLING. Note sur le flambage d'une pièce comprimée stabilisée par des réactions latérales, Bachet. *Annales des Ponts et Chaussées (Partie Technique)*, vol. 2, no. 4, July–Aug. 1933, pp. 121–138. Theoretical mathematical discussion of buckling of compression members stabilized by lateral reactions proportional to lateral displacement of points at which these reactions act.

WOOD PRESERVATIVES, CREOSOTE. Preservation of External Timber by Creosote, A. D. C. Le Sueur. *Surveyor*, vol. 84, no. 2175, Sept. 29, 1933, pp. 263 and 264. Use of creosote; methods of application; pressure system; hot steeping; butt treatment of posts; treatment by brushing.

TUNNELS

WATER-SUPPLY TUNNELS, VANCOUVER, B.C. Million-Dollar, Water-Supply Tunnel for City of Vancouver. *Eng. and Contract Rec.*, vol. 47, no. 44, Nov. 1, 1933, pp. 1013–1018. Construction of inverted siphon, 7½ ft in diameter and 3,104 ft long, replacing pipes across the harbor entrance; rock tunnel is lined with Bonna pipe; welded pipe line added to system; geological studies; sinking shafts; making of lining pipe; handling pipes in tunnels; joining tunnel to pipe lines; welded steel pipe line.

WATER PIPE LINES

CORROSION. Electrolysis and Soil Corrosion in New Orleans, R. J. Kuhn. *Louisiana Eng. Soc.—Proc.*, vol. 19, no. 3, June 1933, pp. 82–90. History of the water distribution networks of New Orleans, with special reference to electrolysis and corrosion observations; electrolysis due to stray railway currents; methods of preventing electrolysis; natural soil corrosion; methods of preventing soil corrosion.

WATER TREATMENT

EMERGENCIES. Treatment of Water Supply After Long Beach Earthquake, R. F. Goudey. *Eng. News-Rec.*, vol. 111, no. 17, Oct. 26, 1933, pp. 502 and 503. Use of trailer-mounted chlorinating unit containing pumps driven either by electricity or gasoline engine for injecting chlorine into water mains under pressure.

FILTRATION PLANTS, OPERATION. How to Combat Short Filter Runs, N. J. Howard. *Eng. and Contract Rec.*, vol. 47, no. 40, Oct. 4, 1933, pp. 945 and 946. Cause of and cures for short filter runs; proper sand size; double filtration; chlorine or chloramine treatment; pre-conditioning methods; artificial turbidity.

OREGON. Carl A. McClain Filtration Plant, R. E. Koon. *Western Construction News and Highways Bldr.*, vol. 8, no. 16, Oct. 1933, pp. 409–412. Description of municipal plant of Portland, Ore., having a nominal capacity of 12 mgd, for treatment of water from Willamette River.

WATER WORKS ENGINEERING

GREAT BRITAIN. Water Supply in England, A. E. L. Chorlton. *Engineering*, vol. 136, nos. 3535 and 3537, Oct. 13, 1933, pp. 401–404, and Oct. 27, pp. 454–457. Historical review; rainfall; consideration of specific areas; scheme of City of Hull to bring 1,500,000 gal per day from hilly moorlands; plant now consists of four single-stage centrifugal pumps on each of three pipe lines; reasons for advocating extension of Metropolitan Water Board's area to 50-mile radius; objections urged against system of mains in form of water grid.

RATE MAKING. Methods of Charging for Domestic Water Supplies, R. L. Dobbin. *Eng. and Contract Rec.*, vol. 47, no. 40, Oct. 4, 1933, pp. 943 and 944. Comparison of advantages and disadvantages of flat rate and metering systems of charges for domestic water supplies. Before Am. Water Works Assn.

TANKS, STEEL. 4,000,000-Gallon Elevated Storage Tank. *Contractors and Engrs. Monthly*, vol. 27, no. 3, Sept. 1933, pp. 11–14. Winter erection of new 4,000,000-gal steel water tank for the City of Sheboyjan, Wis.; construction of heavy concrete foundation.

UNITED STATES. Wide Variety of Topics Discussed at N.E.W.W.A. Convention. *Eng. News-Rec.*, vol. 111, no. 13, Sept. 28, 1933, pp. 384–386. Proceedings of the annual meeting of the New England Water Works Association, including abstracts of the following papers: Pipe Linings and Friction Coefficients, E. T. Killam; Modern Water-Chlorination Practice, L. H. Enslow; Determination of Odors and Tastes in Water, G. M. Fair; Advances in Iron Coagulation and Coagulants, E. L. Bean; Group Management of Water Companies, R. J. Newson; Municipal Management, L. G. Carleton.

WASHINGTON, D.C. History of Washington's Water Supply System, J. D. Arthur, Jr. *Am. Water Works Assn.—Journal*, vol. 25, no. 8, Aug. 1933, pp. 1081–1083. History of water works of Washington, D.C., since 1819.

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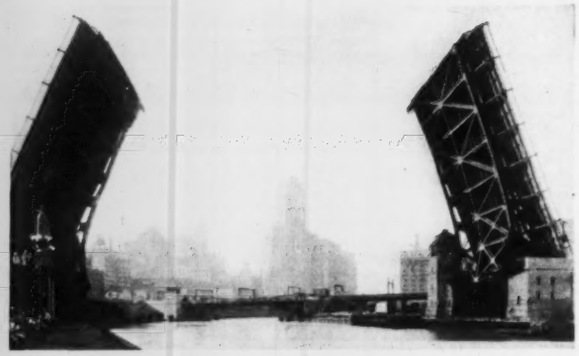

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BRIDGES

CAST IRON. Sixty-Tear-Old Trusses of Cast Iron Still in Service. H. K. Ellis. *Eng. News-Rec.*, vol. 111, no. 20, Nov. 16, 1933, pp. 597 and 598. Two bridges built almost entirely of cast iron, still in service over Saucon Creek, near Bethlehem, Pa.; spans are from 52 to 55 ft in length; date of construction 1870.

CONCRETE ARCH. Eine neue Eisenbetonbruecke bei Bruessel, R. Bernhard. *Bauingenieur*, vol. 14, no. 27–28, July 7, 1933, pp. 372 and 373. Design and construction of concrete arch railroad viaduct, carrying two tracks, near Brussels, Belgium; total length 522 m; semicircular arches are about 30 m in span.

DENMARK. Die Strassen- und Eisenbahnbruecke ueber den Kleinen Belt in Daenemark, A. Engelund. *Bauingenieur*, vol. 14, no. 35–36 and 37–38, Sept. 1, 1933, pp. 443–448; and Sept. 15, pp. 471–473. Design and construction of superstructure of combined steel-truss bridge, known as Little Belt Bridge, connecting island of Fuenen to mainland of Denmark; total length, plus approaches, is 1,177.8 m, including five spans ranging from 137.5 to 220 m in length; clear width of bridge is about 16 m; structural details of steelwork and of concrete piers.

DESIGN. Design of Superstructures for Small Bridges, H. C. Adams. *Surveyor*, vol. 84, no. 2182, Nov. 17, 1933, pp. 453 and 454. Elementary principles of design of simple slab bridges; reinforced concrete deck-girder bridges; plate-girder bridges. Before Inst. Mun. and County Engrs. at Public Works, Roads, and Transport Congress.

FAILURE. Two Railroad Bridge Failures Laid to Inadequate Inspection. *Eng. News-Rec.*, vol. 111, no. 23, Dec. 7, 1933, pp. 687 and 688. I.C.C. Safety Bureau holds that undermining of pier on Anacostia River Bridge, near Washington, D.C., and washing out of abutment on bridge in New Mexico could have been avoided.

FLOORS. Aluminum Enters Bridge Construction, C. M. Reppert. *Eng. News-Rec.*, vol. 111, no. 21, Nov. 23, 1933, pp. 611–615. Reconstruction of Smithfield St. Bridge, in Pittsburgh, which was considered obsolete for modern traffic conditions, by replacing old steel and timber floor with new floor of high-strength aluminum alloy; aluminum-alloy floor framing and ribbed slab surfaced with asphaltic concrete, reducing dead load by more than 1 ton per lin ft; floor slab under load test; costs.

HIGHWAY, GREAT BRITAIN. Development of Road Bridges in Great Britain, C. H. Bressey. *Surveyor*, vol. 84, no. 2182, Nov. 17, 1933, pp. 463 and 464. Review of British practice in the design and construction of highway bridges, including movable bridges, masonry arch bridges, cast-iron arch bridges, reinforced-concrete arch bridges, suspension bridges, and tunnels. Before Inst. Mun. and County Engrs. at Pub Works, Roads, and Transport Congress.

MOVABLE, OREGON. Swing Span of Bridge Is Built on Curve and Grade, H. W. Young. *Eng. News-Rec.*, vol. 111, no. 22, Nov. 30, 1933, p. 657. Design, layout, and fabrication of members for new 118-ft span over the John Day River on the Columbia River Highway in Oregon, complicated by 4-deg curvature and gradient requirements.

PIERS, FOUNDATIONS. Die Verteilung der Bodenpressungen unter starren Gruendungskoerpern, F. Schleicher. *Bauingenieur*, vol. 14, no. 17–18, Apr. 28, 1933, pp. 242–245. Study of distribution of stresses on pier foundations of new Ludwigshafen-Mannheim Bridge over the Rhine River in Germany; observations are in accordance with the theory of elastic-isotropic semi-bounded bodies ("Halbraum"); tests of small models are not applicable to large areas.

PLATE GIRDER, WELDING. Welded Bridge in Germany Sets New Records, R. Leonhardt. *Eng. News-Rec.*, vol. 111, no. 20, Nov. 16, 1933, p. 589. Schlachthof Bridge in Dresden, Germany, which is 1,040 ft long and crosses Ostra tidal channel in thirteen plate-girder spans varying in length from 72½ to 86 ft; structure required 431 tons of steel plate, shop-fabricated into girders and floor beams by automatic welding machine.

RAILROAD. Railroad Viaduct Carried Through Occupied Building, G. T. Gilman. *Eng. News-Rec.*, vol. 111, no. 22, Nov. 30, 1933, pp. 641–644. Solution of problems of foundation and vibration insulation in construction of single-deck double-track structure of New York Central Railroad, carrying freight tracks through Bell Laboratories Building in New York City; foundations adjacent to building footings on piles consist of steel cylinders jacked to rock under air and filled with concrete.

STEEL. Dreigurt-Fachwerktraegerbruecke der Hohenzollerngrube in Beuthen O.-S., P. Walter. *Stahlbau*, vol. 6, no. 17, Aug. 18, 1933, pp. 129–133. Three-chord steel-truss railroad viaduct, 45 m long, 15.1 m wide, at the Hohenzollern coal mine, at Beuthen, Germany.

STEEL-TRUSS, CONSTRUCTION. Extra Trusses Added to Indus River Bridge, W. T. Everall. *Eng. News-Rec.*, vol. 111, no. 22, Nov. 30, 1933, pp. 658 and 659. Reconstruction of Indus River Bridge one hundred miles northeast of Karachi, India, involving new 360-ft trusses rolled into position complete, new floor system, and new cantilever vehicle roadways.

STRESSES. Revision of Allowances for Impact in Railway Underbridges, J. D. W. Ball. *Engineering*, vol. 136, no. 3526, Aug. 11, 1933, pp. 133 and 134. Radical changes introduced; allowances for impact recommended by Bridge Stress Committee take into consideration the effects of hammer blow, lurching, joints, and irregularities in track; for spans over 30 ft, synchronization of two locomotives.

VIADUCTS, RAILROAD. Street-Car Viaduct Built Over Railway Terminal, S. Moreell, Jr. *Eng. News-Rec.*, vol. 111, no. 21, Nov. 23, 1933, pp. 626 and 627. Design and construction, in record time, of steel viaduct through and over Illinois Central Railroad terminal, giving street-car access to Century of Progress Exposition in Chicago; cost about $320,000.

WELDING. Welding Used Extensively for Bridge Repairs. *Welding*, vol. 4, no. 11, Nov. 1933, pp. 494–496. Description of welding operations on I-beam, bascule, swivel, and truss bridges; welding specifications of Pennsylvania Department of Highways.

WOODEN, UNITED STATES. Typical and Notable Timber Bridges. *Roads and Road Construction*, vol. 11, no. 131, Nov. 1, 1933, pp. 341 and 342. Compilation on ordinary highway bridges in the United States, based on articles published in American engineering magazines between 1909–1930.

BUILDINGS

APARTMENT HOUSES, EARTHQUAKE RESISTANT. Earthquake Design for Eight-Story Apartment House, H. R. Hammill. *Eng. News-Rec.*, vol. 111, no. 20, Nov. 16, 1933, pp. 590–592. Design of building, 117.5 ft by 54.1 ft in plan, to carry seismic force of 1 per cent in frame and 4 per cent in walls; additional cost is less than capitalized saving on insurance policies; earthquake code; moment diagram of transverse frame; moment diagram at typical panel point.

BANK BUILDINGS, RECONSTRUCTION. Extending a Bank Into Adjacent Building, J. Eckmann. *Eng. News-Rec.*, vol. 111, no. 23, Dec. 7, 1933, pp. 681 and 682. Extension of the Bowery Savings Bank, on the corner of Fifth Ave. and 34th St., New York, N.Y., into a 13-story building adjoining it on the north.

BRICK, DAMPNESS. Hinweise fuer die Baupraxis zur Verhuetung der Regendurchlaessigkeit. *Tonindustrie-Ztg.*, vol. 57, no. 55, July 10, 1933, pp. 639–641. Recommendations for prevention of rain-water leakage in brick buildings; different types of masonry construction.

CODES, UNITED STATES. Building and Plumbing Codes. *Indus. Standardization*, vol. 4, no. 10, Oct. 1933, pp. 160–175. Symposium of the following papers: Building Codes, G. N. Thompson; Plumbing Code Situation in United States, W. C. Groeniger; National Board of Fire Underwriters' Proposed Uniform Building Code, C. T. Bissell; Building Code Developments on Pacific Coast, D. H. Merrill; and Uniform Building Code for Municipalities of New England, E. W. Roemer.

CONCRETE. Wall Units and Reinforced Concrete Eliminate Need for Forms. *Concrete*, vol. 41, no. 11, Nov. 1933, pp. 7 and 8. Combination wall of concrete building units and of concrete placed on job, which produces in effect reinforced-concrete wall without forms; developed by Nel-Stone Company, of San Antonio, Tex.

EARTHQUAKE EFFECTS. Earthquake Damage to Masonry Structures, and Their Repair, L. T. Evans and M. Rossen. *Am. Concrete Inst.—Journal*, vol. 5, no. 2, Nov.–Dec. 1933, pp. 129–136. Lessons learned from earthquake at Long Beach, Calif., on March 10, 1933; description of damage to buildings and of methods of repair; gunite tests.

HIGH BUILDINGS, EARTHQUAKE EFFECTS. Earthquake-Shock Transmission in Tall Buildings, H. M. Westergaard. *Eng. News-Rec.*, vol. 111, no. 22, Nov. 30, 1933, pp. 654–656. Approximate theoretical analysis of upward progression of shear deformation due to single shock impulse and its successive reflections; free vibrations and velocity of waves; reflection of offsets; system of reflected waves.

MARKET BUILDINGS, ROUMANIA. Die neue Grossmarkthalle in Ploesti, R. Saliger and F. Baravalle. *Bauingenieur*, vol. 14, no. 21–22, May 26, 1933, pp. 281–284. Design and construction of covered market at Ploesti, Roumania, 50 m by 50 m in plan, including octagonal dome 40 m in diameter, with a rise of over 10 m.

WIND EFFECT. Wind Action on Buildings, R. Fleming. *Engineering*, vol. 136, nos. 3538, 3541, and 3542, Nov. 3, 1933, pp. 481–484; Nov. 24, pp. 563–565; and Dec. 1, pp. 590–592. Discussion of prescribed wind pressure on buildings; author's recommendations; wind velocity; wind-bracing connections; review of research work; recommendations of Subcommittee of Structural Division of the Society.

WRECKING. Building Wreckers Develop "Upside-Down" Method of Orderly Demolition. *Construction Methods*, vol. 15, no. 11, Nov. 1933, pp. 18–23. Methods used in clearing site of Rockefeller Center in New York City; group demolition; stripping interior; wrecking walls; safety measures; insurance; reclaiming materials; power shovels and cranes; features of contractor's plant.

CONCRETE

AGGREGATES. Aggregates for Concrete Work, B. H. Knight. *Surveyor*, vol. 84, no. 2179, Oct. 27, 1933, pp. 353 and 354 (discussion) 359 and 360. Various classes of aggregates; requirements for concrete aggregates; natural and artificial products. Before Inst. Sanitary Engrs.

ARCHES. Plastic Flow in Plain and Reinforced-Concrete Arches, E. Probst. *Am. Concrete Inst.—Journal*, vol. 5, no. 2, Nov.–Dec. 1933, pp. 137–141. Discussion of American investigations by R. E. Davis and C. S. Whitney, also of German tests and observations.

CEMENT MORTAR, SULFUR TREATMENT. Mit Schwefel getraenkter Zementmoertel, G. Saenger. *Zement*, vol. 22, nos. 39 and 41, Sept. 28, 1933, pp. 537–541; and Oct. 12, pp. 566–570. Cement mortar impregnated with sulfur; experiments show that, contrary to American test results on concrete, cement mortar is very slow to absorb molten sulfur, except in the case of very lean mixtures; impregnation greatly increases strength and resistance to grinding of mortar; other results and conclusions. See also Engineering Index, 1926, p. 198.

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CINDER. Clamped to Steel Building Frame Electric Vibrators Produce Dense Cinder Concrete for Floor Arches and Fireproofing. *Construction Methods*, vol. 15, no. 11, Nov. 1933, pp. 24–26. Features of special electric vibrators and methods of using them in the construction of floor arches, beams, and columns of new building for the Philadelphia Post Office; concreting procedure; mixing and hoisting plants; saving in labor; tests of bond strength.

DESIGN. Rupture of Concrete and the Estimation of Working Stresses, L. N. Jamieson. *Inst. Engrs. Australia—Journal*, vol. 5, no. 10, Oct. 1933, pp. 325–330. Review of theoretical and experimental studies leading to the conclusion that normal failure of concrete is by splitting; relative potency of tension and extension in causing failure; predominance of extension and slightness of effect of tension; theoretically correct design procedure suggested. Bibliography.

FLOORS, CONCRETE-STEEL. Reinforced Concrete Combined with Light Steel Joists, R. C. Johnson. *Concrete*, vol. 41, no. 11, Nov. 1933, pp. 3 and 4. Composite floor construction employed in 5-story nurses' home; well adopted to light occupancy.

MIXING. Simplified Concrete Mix Design, H. N. Walsh. *Am. Concrete Inst.—Journal*, vol. 5, no. 2, Nov.–Dec. 1933, pp. 110–120. Review of European research on the effects of grading on properties of concrete; use of grading curves for design of mixes; type of grading that produces high quality concrete, which has for its characteristics workability when freshly mixed, density when placed, suitable cement content, and adequate strength when cured. Bibliography.

SLAG. Zerstoerungsarbeit eines Schlackenbetons, F. von Glasser. *Bauingenieur*, vol. 14, no. 31–32, Aug. 4, 1933, pp. 406–410. Observations on chemical disintegration of slag concrete in construction of a school building in Charlottenburg, Germany.

SPECIFICATIONS. Special Low-Heat Cement for Mass Concrete Dams, S. B. Morris. *Am. Water Works Assn.—Journal*, vol. 25, no. 10, Oct. 1933, pp. 1350–1358 (discussion) 1358–1361. Specifications for low-heat-value cement for Pine Canyon Dam, 328 ft high, for Pasadena, Calif.; contribution of individual compounds to heat of hardening; summary of laboratory cement tests.

VIBRATING. Vibration as Means of Placing Concrete, T. C. Powers. *Eng. News-Rec.*, vol. 111, no. 23, Dec. 7, 1933, pp. 684–686. Review of recent American tests showing the advantages of vibrated or mechanically-puddled concrete; data on choice of vibrator.

DAMS

ARCH. Arched Dam. *Engineering*, vol. 136, no. 3541, Nov. 24, 1933, pp. 575 and 576. Editorial review of third and final report on Arch Dam Investigation published by Engineering Foundation, previously indexed.

CONCRETE ARCH. New Type of Dam, A. C. Janni. *Am. Concrete Inst.—Journal*, vol. 5, no. 2, Nov.–Dec. 1933, pp. 103–109. Principles of design of new type of concrete arch dam, avoiding all uncertainties occurring in the design of usual concrete arch dams; main frame consists of series of arches, supported by cantilevers; each arch and each cantilever butts against solid rock at each end, independently from each other; two systems of beams—one horizontal, the other vertical—run in each panel formed by two consecutive arches and two consecutive cantilevers.

CONSTRUCTION. Use Ultra-Modern Methods in Mississippi River Dam, P. C. Peterson. *Concrete*, vol. 41, no. 12, Dec. 1933, pp. 3 and 4. Bulk cement, received in gravity-unloading railway cars, pumped from cars to bins; concrete pumped through 7-in. pipe; slump of concrete ranged from 2 to 3 in.; other special construction features.

HYDRAULIC MODELS. La Similitude des barrages mobiles Expériences de l'usine de la Gentille, C. Camichel, L. Escande and E. Crausse. *Revue générale de l'Electricité*, vol. 34, no. 13, Sept. 30, 1933, pp. 399–401. Abstract of paper on the results of tests of reduced models of movable weirs compared with actual determinations of discharge over prototype weir at the Gentille hydro-electric power plant, previously indexed from *Académie des Sciences*—C. R. Aug. 7, 1933.

MOVABLE. Cumberland River Dam, D. A. Watt. *Eng. News-Rec.*, vol. 111, no. 22, Nov. 30, 1933, p. 660. Discussion of paper entitled: A Frame-Type Dam Readopted for Cumberland River, by F. S. Besson, previously indexed from issue of Oct. 5, 1933.

RESERVOIRS, WASHINGTON. Lake Cle Elum Reservoir, R. J. Newell. *Military Engr.*, vol. 25, no. 144, Nov.–Dec. 1933, pp. 474–478. Design and construction of irrigation reservoir for Yakima Project in the State of Washington, including earth-fill dam about 150 ft high, and 750 ft long, also an outlet tunnel 14 ft in diameter, 1,800 ft long, and a spillway, 200 ft wide, controlled by radial gates, 17 ft high.

UNDERGROUND. Grundwassersperren, Keller. *Bautechnik*, vol. 11, no. 21, May 19, 1933, pp. 270–272. Design and construction of various types of cut-off walls for damming the flow of underground water in arid countries.

WEIRS, DISCHARGE. Discharge Over Circular Weirs, T. Omori. *Soc. Mech. Engrs., Japan—Journal*, vol. 36, no. 197, Sept. 1933, pp. 598–601. Author has tested small weirs for five different diameters from 150–250 mm, and found that discharge from unit weir very closely agrees with those from different weirs within 0.6 per cent of experimental results; circular weir may, therefore, be well adapted for laboratory use on comparatively small quantities of flow as in the case of rectangular and triangular weirs. (In Japanese.)

FLOOD CONTROL

MISSISSIPPI RIVER. Channel Regulation for Mississippi, P. Claxton. *Eng. News-Rec.*, vol. 111, no. 20, Nov. 16, 1933, pp. 584 and 585. Discussion of paper entitled: New Plans for Mississippi, previously indexed from issue of June 22, 1933. Bed load, bank erosion, cut-offs, and branch closure as involved in new plans for Mississippi flood control

FLOW OF FLUIDS

FLOW OF WATER, OPEN CHANNELS. Separate Roughness Coefficients for Channel Bottom and Sides, R. E. Horton. *Eng. News-Rec.*, vol. 111, no. 22, Nov. 30, 1933, pp. 652 and 653. Study, which is largely theoretical, leading to the conclusion that when the bottom and sides of an open channel are of different degrees of roughness, the equivalent coefficient for the channel as a whole varies with the depth of flow.

FOUNDATIONS

SETTLEMENT. Neuere Verfahren in der Analyse und Vorhersage von Bauwerksetzungen, A. Scheidig. *Bautechnik*, vol. 11, no. 30, July 14, 1933, pp. 429–430. Discussion by O. K. Froehlich, of paper on modern methods for analysis and prediction of settlement of clay, loam, and sand, previously indexed from issues of March 24 and April 7, 1933; author's reply.

HYDROLOGY, METEOROLOGY, AND SEISMOGRAPHY

HYDROGRAPHIC SURVEYING. Datum of Soundings in Tidal Waters, H. A. Marmer. *Military Engr.*, vol. 25, no. 144, Nov.–Dec. 1933, pp. 483–485. Variety of datum planes; types of tide; variety of low-water datums; choice of datum.

RAIN AND RAINFALL, PERIODICITY. Tree Growth and Climatic Cycles. A. E. Douglass. *Sci. Monthly*, Dec. 1933, pp. 481–495. Study of indications of periodicity of rainfall and other climatic factors, based on tree-ring records, and sunspot numbers.

INDUSTRIAL BUILDING

ROOFS, WIND EFFECT. Effect of High Winds on Grain Sheds, J. D. W. Ball. *Engineer*, vol. 156, no. 4064, Dec. 1, 1933, p. 551. Cases of failure during violent storms, of sheds of light construction, used for storage of grain in bags; sheds of this type are 16 m wide and from 40 to 100 m in length; experiments by Stanton on models of roofs were carried out with wind velocities varying from 10 to 20 mph.

INLAND WATERWAYS

SILT. Streams in Alluvial Soil, E. S. Bellasis. *Indian Eng.*, vol. 93, nos. 23, 24, and 25, June 10, 1933, pp. 452 and 453; June 17, pp. 475 and 476; June 24, pp. 497 and 498; and vol. 94, no. 1, July 1, 1933, pp. 15 and 16. Review of silt observations and formulas; shaping of channel by stream; Lacey's investigations.

LAND RECLAMATION AND DRAINAGE

CONNECTICUT. Protection of Hartford South Meadows at Hartford, Connecticut. *Boston Soc. Civ. Engrs.—Journal*, vol. 20, no. 9, Nov. 1933, pp. 187–231 (discussion) 232. Symposium consisting of the following papers: Project in General, R. N. Clark; Development of Hartford South Meadows, F. H. Fay; South Meadows Dike, W. S. Brewer; Purpose and Scheme of Operation of South Meadows Pumping Station, Hartford, Connecticut, W. A. D. Wurts; Soil Studies on Hartford Dike, G. Giboy; Model Studies of Dike for Protection of Hartford South Meadows, K. C. Reynolds.

CULVERTS, DESIGN. Partition Walls of Culverts Designed as Brush Collectors. *Eng. News-Rec.*, vol. 111, no. 22, Nov. 30, 1933, p. 648. Straightening and paving of meandering stream in Kansas City, Mo.; in box culverts partition walls were extended upstream to serve as brush collectors; during floods driftwood rides up inclined wall instead of blocking culvert openings.

PORTS AND MARITIME STRUCTURES

DOCKS, SOUTHAMPTON. Southampton's Great Quay and Dry Dock. *Eng. News-Rec.*, vol. 111, no. 21, Nov. 23, 1933, pp. 622–624. Similar in contents to paper previously indexed from *Engineer*, July 7, 14, and 21, 1933.

FRANCE. Les installations du port de Rouen, J. Durmas. *Génie Civil*, vol. 103, no. 23, Dec. 2, 1933, pp. 537–543. Description of port of Rouen on the Seine River, including floating docks, 8,000 to 14,000 tons, keywalls, and loading and unloading equipment; statistical data on traffic and commerce for years 1900 to 1932.

SHORE PROTECTION. Coast Erosion and Protection Discussed at Washington Meeting. *Eng. News-Rec.*, vol. 111, no. 24, Dec. 14, 1933, p. 730. Proceedings of 1933 annual meeting of American Shore and Beach Preservation Assn., including abstracts of papers by W. J. Barden, V. Gelineau, R. K. Hale, F. E. Schmitt, T. Saville, and others.

ROADS AND STREETS

ADMINISTRATION. Rational Planning by State of Public Highway Program, F. T. Sheets. *Am. Highways*, vol. 12, no. 4, (Convention Edition) Nov. 1933, pp. 11–16. Traffic surveys; economic surveys; economic surveys by U. S. Bureau of Public Roads; popularized reports; commission on future road program; personnel of commission; experience of Illinois; legislative battle; synopsis of Illinois laws.

ASPHALT, TESTING. Mechanical Testing of Asphalt, D. M. Wilson. *Surveyor*, vol. 84, no. 2182, Nov. 17, 1933, pp. 461 and 462. Preparation of test pieces; hardness (resistance to impression); stability tests; interpretation and correlation of results. Before Soc. Chem. Industry at Public Works, Roads, and Transport Congress.

BITUMINOUS. Mechanical Testing of Bituminous Road Materials, F. M. Potter. *Soc. Chem. Industry—Journal (Chem. and Industry)*, vol. 52, no. 45, Nov. 10, 1933, pp. 906 and 907. There has been steadily growing opinion that after separate materials have been tested, further group of tests should be applied to the paving mixture when it is being laid; such tests should be designed to demonstrate the serviceability of paving; attention should be given to traffic-load factor, the effect of frost, moisture, and temperature changes.

CONCRETE. Highway Batching Plant Handles Bulk Cement. *Eng. News-Rec.*, vol. 111, no. 20, Nov. 16, 1933, pp. 596 and 597. Use of bulk instead of sack cement for highway paving work, illustrated by procedure and equipment adopted for the first section of the Ridge Route cut-off between Castaic and Gorman, Calif.; special tank bodies on truck and trailer haul combined load of 100-bbl bulk cement for distance of 100 miles.

CONSTRUCTION. Nature and Effect of Surface Coatings on Coarse Aggregates, A. T. Goldbeck. *Am. Highways*, vol. 12, no. 3, July 1933, pp. 9–13. Report to committee on correlation of research in mineral aggregates; surface coatings found on coarse aggregates; stone dust; clay coatings; organic coatings; alkali and salt coatings on coarse aggregate; bituminous oil impregnations and coatings; materials; freezing tests; calcareous incrustations; sugar coatings on aggregate; miscellaneous incrustations.

DESIGN. Making the Highway Pay, B. E. Gray. *Eng. News-Rec.*, vol. 111, no. 22, Nov. 30, 1933, pp. 660–661. Author's reply to discussion of his paper entitled: Making the Highway Pay for Its Cost, previously indexed from the issue of May 11, 1933.

FRANCE. Modern Road Developments in France, P. LeGavrian. *Inst. Mun. and County Engrs.—Journal*, vol. 60, no. 11, Nov. 21, 1933, pp. 837–842. Adaptation of roads to modern traffic; present technical tendencies as regards road surfacing. Before Société des Ingenieurs Civils de France, at Pub. Works, Roads, and Transport Congress.

GATES. Automatic Crossing Gates on Illinois Central. *Ry. Signaling*, vol. 26, no. 12, Dec. 1933, pp. 331–333. Manually operated gates replaced, thus effecting saving of $2,000 annually in operating expense; hydraulically operated gates incorporate simple operating and control arrangement.

GRADE SEPARATION. Long Island's New Traffic Artery Avoids All Grade Crossings. *Concrete*, vol. 41, no. 12, Dec. 1933, p. 7. Grade-separation structures carry 21 cross streets over 12-mile superhighway; accessory features provided; 418,000 sq yd of concrete slabs placed; construction cost $5,000,000.

GREAT BRITAIN. Public Works, Roads, and Transport Congress and Exhibition, 1933. *Roads and Road Construction*, vol. 11, no. 131, Nov. 1, 1933, pp. 346–361. Description of exhibits of portable power plants and machinery for construction and maintenance of roads.

ITALY. Die Fortschritte im italienischen Strassenbau, E. Neumann. *Bautechnik*, vol. 11, no. 30, July 14, 1933, pp. 419–421. Review of recent progress in construction and maintenance of highway system of Italy.

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JUTE CLOTH. Dundee Road Experiment with Jute Cloth, D. B. McLay. *Inst. Mun. and County Engrs.—Journal*, vol. 60, no. 11, Nov. 21, 1933, pp. 18 and 21. Results of four tests; cost data.

LOW-COST. Road Making in Stony Country. *Commonwealth Engr.*, vol. 21, no. 4, Nov. 1, 1933, pp. 115 and 116. Method of constructing country roads by plowing ground with tractor and forming available material into good surface by means of road grader.

MACADAM. Moisture-Film "Cured" Macadams, C. A. Hogentogler, Jr. *Pub. Works*, vol. 64, no. 11, Nov. 1933, pp. 29 and 30. Review of recent studies of stabilization by water film cohesion applied during curing and seasoning period, for furnishing newly constructed macadams with high stability possessed by relatively thin, old traffic-bound roads and macadams.

MACHINERY. Public Works, Roads and Transport Exhibition. *Quarry and Roadmaking*, vol. 38, no. 444, Nov. 1933, pp. 476–495. Features of commercial types of air compressors, screens, drills, concrete mixing plants, road rollers, rock crushers, and cranes.

MAINTENANCE AND REPAIR. Maintenance Methods on Stabilized Gravel Roads, B. C. Tiney. *Eng. News-Rec.*, vol. 111, no. 20, Nov. 16, 1933, pp. 594 and 595. Methods of providing smooth-riding surface, keeping gravel compacted, and preserving original crown and thickness.

MATERIALS, COAL TAR. British Road Tar Association, D. Milne-Watson. *Gas Journal*, vol. 204, no. 3678, Nov. 15, 1933, pp. 523 and 524. Presidential address, with general comment on coal industry, carbonization, gas manufacture, production of liquid fuels from coal, and importance of use of coal tar as road material.

TESTING. Laboratory Tests and Their Correlation with Full-Scale Road Experiments, R. G. C. Batson. *Surveyor*, vol. 84, no. 2182, Nov. 17, 1933, p. 441. Difficulties in correlating laboratory tests with road behavior; influence of consolidation; stability tests. Before Soc. Chem. Industry at Pub. Works, Roads, and Transport Congress.

PORTS AND MARITIME STRUCTURES

BREAKWATERS. Breakwaters on Great Lakes, W. F. Heavey. *Military Engr.*, vol. 25, no. 144, Nov.–Dec. 1933, pp. 486–489. Review of recent practice; timber-crib and rubble-mound breakwaters; concrete superstructures; concrete-caisson breakwaters; wave action; comparative costs; steel breakwaters; corrosion of steel; cost of steel breakwaters.

PORTLAND, ORE. Portland's Busy Port. *Pac. Mar. Rev.*, vol. 30, no. 12, Dec. 1933, pp. 353–357. Fresh-water harbor consists of 200,000 sq miles, and Willamette Valley, tributary to port, contains 11,000 sq miles; protected against fire by three modern fireboats, each capable of pumping 10,000 gal. of water per min; channel from Portland to the sea has a minimum width of 500 ft and a depth of 35 ft; harbor proper varies from 900 to 1,600 ft in width with 27 miles of deep waterfrontage; facilities.

RAILROADS, STATIONS, AND TERMINALS

ST. LOUIS. Electrified Rail Terminal in Downtown St. Louis. *Eng. News-Rec.*, vol. 111, no. 23, Dec. 7, 1933, pp. 671–674. Illinois Terminal Railroad system builds 2½-mile elevated and subway line from McKinley Bridge over the Mississippi to a large freight and passenger terminal; project transforms large section in downtown St. Louis from slum-residential and small-business district to high-class modern manufacturing district; terminal facilities.

SEWERAGE AND SEWAGE DISPOSAL

ACTIVATED SLUDGE. Reducing Cost of Activated Sludge Treatment, E. B. Besselievre. *Water Works and Sewerage*, vol. 80, no. 10, Oct. 1933, pp. 364–366. By combining mechanical agitation with diffused air aeration, four American cities lower their power consumption and procure more flexible operation.

ASSESSMENTS. Application of Sewer Rental Laws, J. H. Fertig. *Sewage Works Journal*, vol. 5, no. 6, Nov. 1933, pp. 967–977. Development and purpose of rental laws; Pennsylvania laws; distribution of costs; measure of rental; financing. Bibliography. Before Pennsylvania Sewage Works Assn.

AUSTRALIA. Sewerage Works at Colac, Echuca, and Mildura, and Experience Obtained in Their Operation, E. T. M. Garlick. *Inst. Engrs. Australia—Journal*, vol. 5, no. 10, Oct. 1933, pp. 330 and 331. Discussion by H. J. N. Hodgson of paper previously indexed from issue of Aug. 1933.

CALIFORNIA. Convention of California Sewage Works Association. *Water Works and Sewerage*, vol. 80, no. 11, Nov. 1933, pp. 415–417. Proceedings of 1933 annual convention, including abstracts of the following papers. Performance of Santa Cruz Ocean Outfall Sewers, R. Fowler; Recent Experiences with Multiple Stage Digestion of Sludge, A. M. Rawn; Removal of Ammonia from Sewage by Zeolites; Methods for Determination of Chlorine Demand of Sewages, A. C. Beyer; Difficulties with Utilization of Sludge Gas, A. J. Smith; Symposium on Operating Problems.

CHEMICAL PROCESS. Chemical Sewage-Treatment Methods Reviewed and Appraised, F. W. Mohlman. *Eng. News-Rec.*, vol. 111, no. 23, Dec. 7, 1933, pp. 676 and 677. Survey of processes operated in recent years; chemical precipitation yields effluent superior to that of plain sedimentation but inferior to effluent from activated-sludge process. Before Central States Sewage Works Assn.

GREAT BRITAIN. Middlesex Sewerage and Sewage Disposal Scheme, J. D. Watson. *Sewage Works Journal*, vol. 5, no. 6, Nov. 1933, pp. 1054–1057. Abstract of paper before Royal Sanitary Inst. previously indexed from *Surveyor*, Oct. 20, 1933.

MILWAUKEE, WIS. Five Years' Operation of Milwaukee Activated Sludge Plant. *Pub. Works*, vol. 64, no. 11, Nov. 1933, pp. 10, 11, and 47. Review of operating experience for period ending January 1933; aeration; sedimentation; sludge disposal; incineration of screenings and grit.

ODOR CONTROL. Elimination of Odors in Sewage-Treatment Works, M. W. Tatlock. *Eng. News-Rec.*, vol. 111, no. 21, Nov. 23, 1933, p. 621. Abstract of paper outlining the experience of the sewage-treatment plant of Dayton, Ohio. Before Central States Sewage Assn.

OHIO. Sanitary Improvement Program Solves Pollution Problem, T. B. Henry. *Eng. News-Rec.*, vol. 111, no. 24, Dec. 14, 1933, pp. 703–705. Description of combined project of river-straightening and intercepting sewer and sewage-plant in Findlay, Ohio; preliminary treatment providing for subsequent additions to care for secondary treatment; sewer rental, based on water consumption, pays for operation; digestion tank; sludge glassover.

OPERATION. Operating Experiences in New York State, C. C. Agar. *Sewage Works Journal*, vol. 5, no. 6, Nov. 1933, pp. 1007–1019 (discussion) 1020. New York State's experience as to bar screens, plain sedimentation tanks, Imhoff tanks, separate digestion plants, trickling filters, sand filters, sludge removal, sludge beds, industrial wastes, experimental works. Before Pennsylvania Sewage Works Assn.

SEWAGE ANALYSIS, BIO-CHEMICAL OXYGEN DEMAND. Oxygen Demand Test and Its Application to Sewage Treatment, J. K. Hoskins. *Sewage Works Journal*, vol. 5, no. 6, Nov. 1933, pp. 923–934 (discussion) 934–936. Course of oxidation of organic matter; bio-chemical-oxygen-demand test; advantages and limitations; interpretation of results of test; oxygen demand of sewage and sewage-plant effluents, and of sludge; oxygen demand in receiving stream. Bibliography.

STRUCTURAL ENGINEERING

ARCHES, DESIGN. Solving Bending Moments in Fixed Ended Arches, F. F. Ferguson. *Civ. Eng. (London)*, vol. 28, no. 327, Sept. 1933, p. 326. Discussion of paper entitled: Method of Deriving Bending Moment Diagram for Fix-ended Arch Under Dead Loads, by R. E. Wallis, previously indexed from issue of June 1933.

FLOORS, CONCRETE JOISTS. Progress with Precast Concrete Joist Floors for Residences, R. E. Copeland. *Rock Products*, vol. 36, no. 10, Oct. 25, 1933, pp. 50 and 51. Summary of progress made by manufacturers and test program on joist floors underway in research laboratory of the Portland Cement Assn.

INFLUENCE LINES. Influence Lines, D. Y. Hill. *Structural Engr.*, vol. 11 (New Series), no. 10, Oct. 1933, pp. 422–428. Elementary review of method of influence lines; examples.

STATICALLY INDETERMINATE STRUCTURES, STRESSES. Modellverfahren zur Ermittlung der inneren Kraefte von beliebig belasteten, statisch unbestimmten Tragwerken, etc., K. Schaechterle. *Beton u Eisen*, vol. 32, no. 11, June 5, 1933, pp. 174–176. Model tests for determination of internal stresses of statically indeterminate structures, subjected to end stresses by means of patented torsional strain gage.

TUNNELS

RAILROAD, GERMANY. Der Stempelkopftunnel der Nebenbahn Eisenberg (Pfalz)—Enkenbach, H. Friedrich and K. Horbelt. *Bautechnik*, vol. 11, no. 21, May 19, 1933, pp. 267–270. Construction of single-track, concrete-lined railroad tunnel, 481 m long, on new railroad branch, Eisenberg—Enkenbach, Germany; tunnel drainage; cost about 1,000,000 m.

VEHICULAR, GREAT BRITAIN. Mersey Tunnel: History, Plan and Construction of New Vehicular Tunnel Connecting Liverpool and Birkenhead, A. G. Walker. *Chem. Met. and Min. Soc. S. Africa—Journal*, vol. 33, no. 12, June 1933, pp. 367–374 (discussion) 374 and 375. Description similar to various papers previously indexed.

WATER PIPE LINES

LEAKAGE. Locating and Eliminating Underground Street Leakage in Chicago Distribution System, J. B. Eddy and B. Phillips. *Am. Water Works Assn.—Journal*, vol. 25, no. 10, Oct. 1933, pp. 1339–1345 and (discussion) 45–49. Underground street leakage, 1910 to 1915 inclusive, leakage in connection with street paving, 1916 to 1932; tests for underground leakage by street-improvement parties; leakage work in connection with metering, 1926, 1927, and 1928; rehabilitation work, 1931, 1932, and 1933.

WATER TREATMENT

COAGULATION. Coagulation with Aluminum Sulfate, A. G. Nolte and W. A. Kramer. *Am. Water Works Assn.—Journal*, vol. 25, no. 9, Sept. 1933, pp. 1263–1278. Report on laboratory and plant studies made at the Chain of Rocks water treatment plant, St. Louis, Mo.; turbidity versus time of mixing; turbidities resulting from various periods and velocities of mixing; results of split treatment with aluminum sulfate; turbidity and rate of floc formation with various charges of aluminum sulfate.

CHLORINATION, AMMONIA - CHLORINE. Ammonia in Water Treatment, L. H. Enslow. *Water Works and Sewerage*, vol. 80, no. 10, Oct. 1933, p. 379. General discussion of use of ammonia and its compounds in water treatment; future of ammoniation.

FILTRATION PLANTS, EASTON, PA. New Filtration Plant of Easton, Pa., R. W. Haywood, Jr. *Water Works and Sewerage*, vol. 80, no. 10, Oct. 1933, pp. 349–353. Description of new filtration plant of Lehigh Water Company at Easton, Pa., consisting of two four million gallon units; pre-chlorination; mixing and coagulating; wash water facilities.

GREAT BRITAIN. Rivers as Sources of Public Water Supplies, J. S. Pickering. *Surveyor*, vol. 84, no. 2180, Nov. 3, 1933, pp. 375 and 376. Treatment methods at Cheltenham; purification and pumping plant improvements; reservoir growths; Cheltenham's unlimited supply; treatment of raw river water; slow sand filtration; chlorination; pumping plant and mains. Before Royal Sanitary Inst.

MANGANESE REMOVAL. Successful Experiments in Use of Prechlorination in Removal of Manganese, M. J. Davis. *Water Works Eng.*, vol. 86, no. 24, Nov. 29, 1933, pp. 1192 and 1193. Experience of Water Board of Wellsburg, W.Va., in the use of prechlorination for the removal of black deposit accumulating on zeolite softener; diagram showing various points of application of chlorine in experiments in demanganization; manganese content at various stages of treatment; cost of treatment. Before Eighth Annual W.Va. Conference on Water Purification.

WATER WORKS ENGINEERING

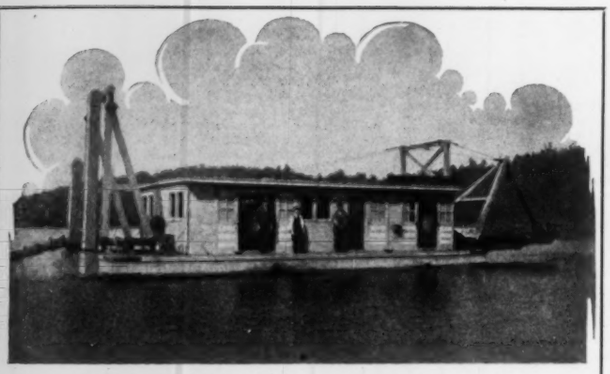
GREAT BRITAIN. British Water Works Association. *Water and Water Eng.*, vol. 35, no. 425, Nov. 20, 1933, pp. 643–652. Abstracts of papers presented to Public Works Congress on Nov. 16, 1933: Legal Aspect of Water Supply for Fire Protection Purposes, J. Hall; Pooling of Supplies by Interconnection of Water Undertakings, Regional Grids and Trunk Mains Through Rural Areas, A. E. L. Chorlton; Water Pollution Research, A. Parker.

HYDRANTS, FROST PROTECTION. Round Table. *Water Works Eng.*, vol. 86, no. 24, Nov. 29, 1933, pp. 1200–1203. Practical discussion, by waterworks superintendents, of use of calcium chloride, alcohol, glycerine, etc., in preventing the freezing of hydrants during the winter; causes of freezing.

LAWS AND LEGISLATION. Recent Court Decisions, Both in Regard to Construction and Maintenance, in Litigation Involving Water Works, L. T. Parker. *Water Works Eng.*, vol. 86, no. 22, Nov. 1, 1933, pp. 1097–1099. Employment of brokers to sell bonds; payment due under budget plan; legal indebtedness; prior rights of water supply; and limitation of riparian owners' use of water.

MANAGEMENT. Problems That Arise in Centralized Management of Large Group of Water Companies, R. J. Newsom. *Water Works Eng.*, vol. 86, no. 21, Oct. 18, 1933, pp. 1044–1046. Organization and management of Community Water Service Company, operating 42 water works plants in 11 states; bookless bookkeeping method; purchase of material and equipment; control of expenditures; handling of revenues; operating budgets; meter repairs, under direction of central office man; financial reports. Before convention of New England Water Works Assn.

METERING. Metering of Public Water Supplies, A. P. Laing. *Inst. Mun. and County Engrs.—Journal*, vol. 60, no. 8, Oct. 10, 1933, pp. 533–550 (discussion) 551–557. General review; economics of supply; assessing distribution charges; combination of rate and meter; charging by meter; choice of meter; location of meters; installation of meters; effect of installing meters; accuracy of meters; testing of meters; care and operation of meters; summary of conditions of supply in South Africa.



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BRIDGES

BASCULE, DESIGN. Strength in Bearing of Webs of Track and Segmental Girders for Rolling Bascule Bridges, W. M. Wilson and R. W. Kluge. *Am. Ry. Eng. Assn.—Bul.*, vol. 35, no. 357, July 1933, pp. 11–35. Information on which to base the design of webs of segmental and track girders; rolling tests to determine the effect of discontinuity of web and discontinuity of sole plate; static tests to determine the distribution of stress in a vertical plate carrying loaded segmental plate on its plane top surface.

CONCRETE FRAME. Rigid Frame Bridges in Reinforced Concrete, A. P. Mason. *Structural Engr.*, vol. 11 (New Series), no. 12, Dec. 1933, pp. 478–502. Review of modern practice of design; tabulated design data. Before Inst. Structural Engrs.

CURVED. Gekruemmte Eisenbeton-Bogenbruecken. *Schweiz Bauzeitung*, vol. 102, no. 18, Oct. 28, 1933, pp. 218 and 219. Features of two concrete-arch highway bridges in Switzerland; curved in alignment; up to 82 m. in span.

DESIGN. Design of Superstructures for Small Bridges, H. C. Adams. *Inst. Mun. and County Engrs.—Journal*, vol. 60, no. 12, Dec. 5, 1933, pp. 913–939. Design of simple slab bridge, reinforced-concrete deck girder bridges, steel bridges, and plate girder bridges; design of deck slab; design of stringers.

FLOORS. Structure-Aluminum Practices on Smithfield Street Bridge. *Eng. News-Rec.*, vol. 111, no. 26, Dec. 28, 1933, pp. 783–787. Symposium on erection and fabrication procedure for new floor added to the famous bridge crossing the Monongahela River at Pittsburgh. Symposium consists of: Erecting Aluminum Bridge Floor, H. D. Johnson, Jr.; Fabricating Structural Aluminum, C. G. Schade.

HIGHWAY, AUSTRIA. Die neuesten Bundesstrassenbruecken in Oesterreich, A. Hafner. *Zeit des Oesterreichischen Ingenieur u Architekten Vereines*, vol. 85, no. 21/22, May 26, 1933, pp. 117–124, 4 supp. plates. Structural features of highway bridges, mostly of short-span reinforced-concrete type, recently built by the Federal Government of Austria.

LIFT. Vertical-Lift Drawbridges, E. E. R. Tratman. *Engineer*, vol. 156, nos. 4065 and 4066, Dec. 8, 1933, pp. 562–564, and figs. on p. 572; Dec. 15, 1933, pp. 586–589. Dec. 8: Typical lift bridge; examples; design; advantages; Halsted Street lift bridge, Chicago; cable systems; bridge guides. Dec. 15: Lever-operated bridges; multiple-lift bridges; Hackensack River and Des Plaines River bridges; electric control; bridge locks and signals; tracks on lift bridges; designers of lift bridges.

LOUISIANA. Atchafalaya River Bridge Sets New Records, D. T. Jerman. *Eng. News-Rec.*, vol. 111, no. 26, Dec. 28, 1933, pp. 776–778. Construction of recently completed highway bridge over the Atchafalaya River, between Morgan City and Berwick, La., consisting of two 126-ft deck-truss spans; three 608-ft through-truss spans and long approaches; and one reinforced-concrete pier sunk to a depth of 177 ft below water level.

RAILROAD. Zur Berechnung der Tragfaehigkeit eiserner Eisenbahn-Bruecken, J. Schreier. *Organ fuer die Fortschritte des Eisenbahnwesens*, vol. 88, no. 2, Jan. 15, 1933, pp. 29–38, 1 supp. plate. Theoretical discussion of methods of determining carrying capacity of steel railroad bridges.

RECONSTRUCTION. Bridge Capacity Increased From 12 to 30 Tons, F. B. Doolittle. *Eng. News-Rec.*, vol. 111, no. 23, Dec. 7, 1933, pp. 683 and 684. Pin-connected 100-ft truss span at the Peekskill (N.Y.) plant of the Fleischmann Yeast Company strengthened under traffic and without falsework by welded reinforcement; new tension members attached to pins after being lengthened by heating, to assure carrying of dead-load stress.

STEEL. Accuracy of Steelwork for Highway Structures, F. D. Hartford. *Roads and Streets*, vol. 76, no. 11, Nov. 1933, pp. 391–393. Tolerance in material; shop methods for reducing mill variations; tolerances in fabrication and erection; methods for reducing fabricating and erection tolerances; how the highway engineer can aid the steel man.

SUSPENSION, SAN FRANCISCO-OAKLAND. San Francisco-Oakland Bay Bridge Progress. *Western Construction News and Highways Bldr.*, vol. 8, no. 18, Dec. 1933, pp. 491–493. Progress report on the San Francisco-Oakland Bay Bridge; San Francisco cable anchorage and approach piers; West-Bay tower piers and center anchorage; Yerbe Buena Island crossing; East-Bay substructure; superstructure contracts.

VENICE, ITALY. Mestre-Venice Viaduct. *Engineer*, vol. 156, no. 4068, Dec. 29, 1933, pp. 640–642. Bridge road runs for 5 km on mainland; bridge proper is composed of series of arcades placed co-axially with railway bridge; viaduct consists of 228 arches built of bricks and cut stone, each having a span of 10.63 m; arches are arranged in groups of five, separated by main piers, 8.65 m wide.

BUILDINGS

AUDITORIUMS, ST. LOUIS, MO. St. Louis Builds Great Auditorium. *Eng. News-Rec.*, vol. 111, no. 26, Dec. 28, 1933, pp. 771–775. Design and construction of municipal community center occupying a site of 3½ acres and including a theater with a seating capacity of 3,500 and an arena with a seating capacity of 12,000.

BUILDING MATERIALS, CLAY PRODUCTS. Face Brick and Terra Cotta—Today and Tomorrow, W. D. Richardson. *Clay-Worker*, vol. 100, no. 5, Nov. 1933, p. 164. Discussion of paper entitled: Discussion of Clay Products in Architecture of Tomorrow, by G. F. Oman, previously indexed from issue of October 1933.

EARTHQUAKE EFFECTS. Eisenbetonbauten in Erdbebengebieten, R. Briske. *Beton u Eisen*, vol. 32, no. 17, Sept. 5, 1933, pp. 261–263. Observations on destructive effects of earthquakes on buildings in Greece, Bulgaria, Palestine, and Japan.

EXITS. Building Exits, H. E. Plummer. *Eng. News-Rec.*, vol. 111, no. 26, Dec. 28, 1933, p. 789. Discussion of two papers entitled: Survey of Exit Practice in Buildings, and Survey of Traffic Volumes Through Building Exits, by H. B. Houghton and J. H. Courtney, previously indexed from issues of Aug. 10 and 17, 1933, respectively.

FORESTRY, BUILDINGS. Forstdienstgehoefte, Imand. *Zentralblatt der Bauverwaltung*, vol. 53, no. 44, Oct. 11, 1933, pp. 521–528. Plans and designs for several types of forestry administration buildings in German forests.

SPECIFICATIONS. Specifications—In Light of Tradition, Experience, and Research, B. P. Davies. *Inst. Mun. and County Engrs.—Journal*, vol. 60, no. 12, Dec. 5, 1933, pp. 873–902 (discussion) 903–912. Discussion of specifications, construction, and maintenance of buildings—with special reference to resistance to weather and dampness—and roof construction. Before Pub. Works, Roads, and Transport Congress.

TOWERS, ITALY. La torre littoria di Milano, C. Chiodi. *Politecnico*, vol. 81, no. 8, Aug. 1933, pp. 455–474. Analysis of stresses and design of welded and riveted skeleton steel-frame of Littoria Tower, in Milan, Italy, having a hexagonal base, 12 m in diameter, and reaching a height of 104 m; wind stresses.

VIBRATIONS. Vibration in Roads and Buildings, C. H. Bradbury. *Surveyor*, vol. 84, no. 2183, Nov. 24, 1933, pp. 495 and 496. Vibration of elastic bodies; principles of vibration transmission; transmission of ground waves; properties of vibration insulators; causes and prevention of vibration; vibration of buildings. Before Inst. Mun. and County Engrs., at Pub. Works, Roads, and Transport Congress.

CITY AND REGIONAL PLANNING

EXPRESSWAYS. 160-Mile Elevated Superhighway System Proposed for Chicago. *Roads and Streets*, vol. 76, no. 12, Dec. 1933, pp. 433–437. Outline of plan that will cost $100,000,000; proposed four-lane construction in widened street; accelerating and decelerating lanes; roadway cross section; roadway surface; ramps; illumination; cost estimates.

TENNESSEE VALLEY AUTHORITY. New TVA Town of Norris, Tennessee, E. S. Draper. *Am. City*, vol. 48, no. 12, Dec. 1933, pp. 67 and 68. Plan and development of Norris, for the temporary housing of 2,000 workers during the construction period at Norris Dam, and also for the permanent residential element; "free-way" and protective zone; lot sizes and grouping of houses; future community.

CONCRETE

ANALYSIS. Statistisch-mathematische Auswertung systematischer. Betonuntersuchungen, L. Bendel. *Schweiz Bauzeitung*, vol. 102, no. 7, Aug. 12, 1933, pp. 75–80. Statistical study of results of 75,000 analyses of cement, gravel, and concrete; determination of correlation coefficients; preparation of three-dimensional graphs.

BEAMS. Stresses at Crack, Size of Crack, and Bending of Reinforced Concrete, H. M. Westergaard. *Am. Concrete Inst.—Journal*, vol. 5, no. 2, Nov./Dec. 1933, pp. 93–102. Study of individual crack leading to a revision of the conventional picture of stresses in reinforced-concrete beams; at crack compressive strains in direction of beam are not proportional to distance from neutral axis; relative advantage of smaller sizes of reinforcing bars; numerical example.

COLUMNS, STEEL-CONCRETE, DESIGN. Die Stahlsaeule und ihre neuesten Verbesserungen, F. Emperger. *Zeit des Oesterreichischen Ingenieur und Architekten Vereins*, vol. 85, no. 19/20, May 12, 1933, pp. 111–114. Review of recently formulated rules for the design of reinforced-concrete and steel-concrete columns.

CONSTRUCTION. Field Control of Concrete, J. H. McKinney. *Eng. Journal*, vol. 16, no. 12, Dec. 1933, pp. 506–510. Field control of concrete in construction of new pier and quay wall at West Saint John; classes of concrete used, tests and method of grading for aggregate, and precautions taken in placing, testing, and curing concrete; measures taken to ensure satisfactory placing under winter conditions; comparative compression tests. Before Eng. Inst. Canada.

DISINTEGRATION. Results of Tests on Effect of Molasses on Concrete, M. N. Clair and M. A. Morrissey. *Eng. News-Rec.*, vol. 111, no. 26, Dec. 28, 1933, p. 775. Experimental study of effect of molasses on cement of concrete storage tanks; use of protective treatments, such as magnesium fluorosilicate, sodium silicate, and colorless waterproofing.

FOOTBRIDGES, CONCRETE. Precast Reinforced-Concrete Footbridges. *Concrete and Constr. Eng.*, vol. 28, no. 11, Nov. 1933, pp. 625–631. Construction of overhead railroad crossings for pedestrians across the tracks of the Southern Railway Company in Great Britain, using precast concrete trestles and other parts.

GRAIN ELEVATORS. Rapid Reinforced Concrete Silo Construction. *Concrete and Constr. Eng.*, vol. 28, no. 12, Dec. 1933, pp. 681–689. Construction in record time of grain silo, 140 ft by 130 ft by 128 ft high, on the south side of the Royal Victoria Dock; 88 ft of walling built in less than 7 days.

MIXING. Limitations of $1:n:2n$ Proportions for Concrete, H. N. Walsh. *Civ. Eng. (London)*, vol. 48, no. 329, Nov. 1933, pp. 408–410. Critical review of properties of certain concrete mixes, in light of theory and practice. Bibliography.

PROTECTIVE COATINGS. Ueber die Untersuchung von Betonschutzmitteln, C. R. Platzmann. *Tonindustrie-Ztg.*, vol. 57, no. 75, Sept.

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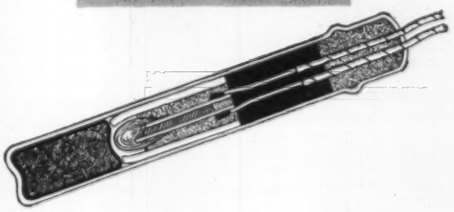

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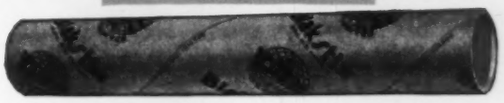

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18, 1933, pp. 883 and 884. Investigation of concrete protective coatings; testing methods; mortar admixtures; bituminous coatings.

RAILROAD STRUCTURES, WATERPROOFING. Acute Waterproofing Problem Solved. *Ry. Eng. and Maintenance*, vol. 29, no. 12, Dec. 1933, pp. 590 and 591. Example of successful waterproofing of light concrete slab over a series of tracks and platforms at Ottawa, Ont.; membrane layer independent of slab and protection course; statement of conditions; various stages of waterproofing construction.

SLABS, STRESSES. Spannungen in durchlaufenden Scheiben bei Vollbelastung saemtlicher Felder, H. Craemer. *Beton u Eisen*, vol. 32, no. 15, Aug. 5, 1933, pp. 233–237. Mathematical analysis of stresses in continuous slabs carrying full load on all spans.

TESTING. Der Eindringversuch zum Messen der Verarbeitbarkeit des Betons, O. Graf. *Beton u Eisen*, vol. 32, no. 20, Oct. 20, 1933, pp. 321 and 322. Outline of penetration method of testing for determination of workability of concrete.

CONSTRUCTION INDUSTRY

COSTS. Unit Bid Summary. *Western Construction News and Highways Bldr.*, vol. 8, no. 18, Dec. 1933, pp. 498, 500, 502, 504, 506, and 508. Unit costs bid on irrigation and reclamation projects, street and road work, and sewer construction, in Oregon, Washington, Nevada, and California.

DAMS

BOULDER DAM PROJECT, SPILLWAYS. Spillways in Canyon Walls to Handle Floodwaters, D. C. McConaughy. *Eng. News-Rec.*, vol. 111, no. 25, Dec. 21, 1933, pp. 754–756. Two side-channel spillways providing discharge capacity of 400,000 cu ft per sec; drainage-system design; automatic steel drum gates to hold reservoir level 24 ft above fixed spillway crest; lining of sides and bottom of spillway channels and transitions with 24-in. thickness of concrete.

CONCRETE CONSTRUCTION. Huge Refrigeration Plant Reduces Heat of Hydration. *Eng. News-Rec.*, vol. 111, no. 25, Dec. 21, 1933, pp. 748–750. Chemical heat dissipated by pumping cold water through 300 miles of 1-in. pipe; two stages of cooling provide efficient and economical operation; refrigeration equipment for cooling 3,400,000 cu yd of concrete; cooling tower and header pipe yard; pumping plant.

DESIGN. Trial-Load Method of Masonry Dam Analysis, I. E. Houk. *Western Construction News and Highways Bldr.*, vol. 8, no. 17, Nov. 1933, pp. 455–460. Development of trial-load method; effects of tangential shear and twist on stresses in Boulder Dam and the use of this method in dam design; model test of Gibson Arch Dam showing radial adjustments; comparison of deflections calculated by trial-load method with those measured on concrete model for temperature and full-depth mercury load tests; verification of analyses.

GEOLOGY. Gorge Excavation Confirms Geological Assumptions. *Eng. News-Rec.*, vol. 111, no. 25, Dec. 21, 1933, pp. 761–763. Original advice on geological features of Black Canyon (Boulder Dam project) checked by subsequent investigations; removal of river fill reveals tight and sound canyon floor ideal for foundation of dam; evidence points to movement of entire river sediment during floods.

HYDRAULIC FILL, CALIFORNIA. El Capitan Water Supply Dam for San Diego, R. P. Bryan. *Western Construction News and Highways Bldr.*, vol. 8, no. 18, Dec. 1933, pp. 485–487. Progress report on construction of rock embankment-hydraulic fill structure, 217 ft high above stream bed; crest length 1,160 ft.

MASONRY, CONSTRUCTION. Technische Neuerungen beim Bau der Saidenbachtalsperra, W. Zscheile. *Bautechnik*, vol. 11, no. 38, Sept. 8, 1933, pp. 516 and 517. Review of novel construction methods used in construction of the Saidenbach Dam, in Germany, containing about 200,000 cu m of masonry and 20,000 cu m of concrete; design of lime and mortar plant; use of new type of rotary pumps; details of cement grouting procedure.

ROCK FILL, BLASTING. Record Well-Drill Blast Aids Progress in San Gabriel Dam No. 2, R. C. Fleming. *Explosives Engr.*, vol. 2, no. 8, Aug. 1933, pp. 231–237. Construction features of dam; blasting preparation; sixteen 6-in. holes put down at rate of 2 ft per hour by 3 Armstrong electric well rigs; holes were located with 20 and 40 per cent Gelatin Extra L.F., Herculite No. 20 and Apache No. 5 and Hercomite, amounts varying with character of hole; blast brought down 300,000 cu yd of rock.

FLOOD CONTROL

CHINA. Flood Control, Navigation, and Irrigation Projects for Huai River System, China. *Engineering*, vol. 136, no. 3544, Dec. 15, 1933, pp. 646 and 647. Brief note on extensive project.

EROSIVE EFFECTS. Beobachtungen ueber den Wasserangriff auf eine Kiesbank, L. Muehlhofer. *Zeit des Oesterreichischen Ingenieur und Architekten Vereines*, vol. 85, no. 37/38, Sept. 15, 1933, pp. 205–207. Field study of effect of flood overflow of Inn River, in Austrian Tyrol, on shape and extent of gravel bank, marked with tar strips for purposes of this study.

RHINE RIVER. Die Hochwasser des Rheins bei Basel in der Zeit von 1808 bis 1930, L. Oexle. *Bautechnik*, vol. 11, no. 34, Aug. 11, 1933, pp. 470–472. Records and frequency of floods on Upper Rhine River at Basel for the period from 1808 to 1930; frequency of floods of given intensity.

FOUNDATIONS

CAISSONS, CONCRETE. Die Berechnung massiver Druckluft-Senkkasten aus Eisenbeton, H. Grassberger. *Bautechnik*, vol. 11, no. 42, Sept. 29, 1933, pp. 594–598. Analysis of stresses in, and principles of design of, reinforced-concrete pneumatic caissons; numerical examples.

PILES, CONCRETE. Impact on Reinforced Concrete Piles. *Concrete and Constr. Eng.*, vol. 28, no. 12, Dec. 1933, pp. 690–692. Methods and results of study of effect of impact during driving of reinforced-concrete piles, being carried out by the Building Research Station in cooperation with the Federation of Civil Engineering and Public Works Contractors, Great Britain.

HYDRAULIC ENGINEERING

HYDRODYNAMICS. Zur Frage der Abrundung und Zuschaerfung umstroemter Kanten, F. Weinig. *Zeit fuer Angewandte Mathematik u Mechanik*, vol. 13, no. 3, June 1933; pp. 224–235. Theoretical mathematical study of rounding and sharpening of edges in current; starting from Rankine's semi-body, author determines sharpening on vanes of any acute angle; velocity-distribution for symmetrical flow; case of unsymmetrical stream.

HYDRO-ELECTRIC POWER PLANTS

BOULDER DAM PROJECT, WELDING. Blowpipe for Heavy Construction. *Oxy-Acetylene Tips*, vol. 12, no. 12, Dec. 1933, pp. 269–274. Features of construction; narrative consisting of items selected from reports of oxy-acetylene service operator.

SWEDEN. Recent Hydro-Electric Power Plants in Sweden. *Engineer*, vol. 156, nos. 4061, 4062, 4063, and 4064, Nov. 10, 1933, pp. 448–451; Nov. 17, pp. 482–484 and 494; Nov. 24, pp. 510–512; and Dec. 1, pp. 538–540 and 548. Illustrated description of three stations. Nov. 10 and 17: hydro-electric plants on Cora River, Vargon power plant and dam, Kaplan turbines; Nov. 24: Krangede works; Dec. 1: other power stations on Indal River, cofferdams, Sillre power plant.

HYDROLOGY, METEOROLOGY, AND SEISMOGRAPHY

EARTHQUAKES. Studies of Earthquake Action Promise Better Structures, J. B. Macelwane. *Eng. News-Rec.*, vol. 111, no. 26, Dec. 28, 1933, p. 779. Review of recent studies and observations in California, New Zealand, and Japan. Before Engrs. Club, St. Louis.

RAIN AND RAINFALL, GREAT BRITAIN. New Studies of Rainfall, J. Glasspoole. *Discovery*, vol. 14, no. 168, Dec. 1933, pp. 377–380. Rainfall observations in Great Britain; summation curve of departures from normal rainfall in Great Britain for years 1863–1932.

IRRIGATION

CANALS, SPECIFICATIONS. Earthwork All-American Canal. *U. S. Bur. Reclamation—Specifications*, no. 561, 1933, 12 pp., 3 supp. plates. Specifications, schedules, and drawings of earthwork, all-American Canal station 1130 to station 1860, Boulder Canyon Project, Arizona-California-Nevada; project involves over 20,000,000 cu yd of common excavation and 484,000 cu yd of solid rock excavation.

LAND RECLAMATION AND DRAINAGE

CULVERTS, CAST IRON. Strength Tests of Cast-Iron Culvert Pipe, E. F. Kelley and W. F. Kellermann. *Pub. Roads*, vol. 14, no. 9, Nov. 1933, pp. 157–178. Review of inconsistencies in specifications for cast-iron culvert pipes, and report on series of tests of five varieties of pipes, for use in drawing up rational specifications; influence of position of load; deflection of pipe; modulus of rupture; bending tests on strips cut from pipe.

GERMANY. Bemerkungen zur Trockenlegung des Frischen Haffs, F. Jerosch. *Bautechnik*, vol. 11, no. 37, Sept. 1, 1933, pp. 505–507. Discussion of scheme for reclamation of Bay of Frisches Haff near Danzig, Northeastern Germany.

MACHINERY. Land-Drainage Machinery, J. H. Blackaby. *Engineering*, vol. 136, no. 3546, Dec. 29, 1933, pp. 702, 703, and 714. Brief note on mole draining; direct-tractor haulage; cable-drawn excavator for cutting trenches for pipe laying; ditching machines; dragline excavators. Before Sec. M, British Assn.

PORTS AND MARITIME STRUCTURES

FIRE PREVENTION. Piers Given Thorough Protection Against Substructure Fires. *Ry. Age*, vol. 95, no. 23, Dec. 2, 1933, pp. 785–788. Wrought-iron fire stops, sprinklers, and cellar nozzle holes in decks of Pennsylvania Railroad structures in New York, N.Y., which ensure quick control of any outbreaks.

FRANCE. La construction du brise-mer des Arros, près de Soulac (Gironde), E. Fischer. *Technique des Travaux*, vol. 9, no. 9, Sept. 1933, pp. 556–564. Design and construction of Arros breakwater, next to Gironde estuary, France; total length 1,300 m; height about 4 m; breakwater is built of precast concrete blocks and natural boulders, from 3 to 6 tons in weight.

GDYNIA, POLAND. New Poland: Evolution of Port of Gdynia. *Naut. Gaz.*, vol. 123, no. 26, Dec. 23, 1933, pp. 5–8 and 30. Historical review; port situated on southeastern coast of Gulf of Danzig, includes Marshal Pilsudski's Basin, Port Canal, and Second Basin; entrance protected from sea by breakwater; access to inner port through two entrances in outer basin; main entrance to canal 40 ft deep; passenger pier 400 m long and 120 m wide; principal commodities imported through Gdynia.

HALIFAX. Halifax—Canada's Atlantic Gateway, A. S. Martin. *Naut. Gaz.*, vol. 123, no. 26, Dec. 23, 1933, pp. 10, 11, and 32. Sailing directions of chart of harbor published in 1763; plans for future developments; reconstruction work of Pier 2, which was practically destroyed by fire, Sept. 18; port facilities; its use for shipment of grain and other products.

LIGHTING. Un court historique de l'emploi des projecteurs dans la marine merchande, J. Rey. *Assn. Maritime et Aeronautique—Bul.*, no. 37, 1933, pp. 57–65, (discussion) 66–69, 1 supp. plate. Use of floodlighting in merchant marine and for lighting canals; history of process from 1859 till present time; early applications of lighting to ports and canals; experiments on the Suez Canal.

TRAIN FERRIES, JAPAN. Nanking-Pukow Train Ferry. *Ry. Gaz.*, vol. 59, no. 24, Dec. 15, 1933, pp. 886–888. Description of bridge approaches to suit variation of river level of 25 ft; machinery is electrically interlocked.

WOODEN. Ueber die Wirtschaftlichkeit der Terroeltraenkung kieferner Dalben- und Reibepfaehle nach dem Rueping-Verfahren, H. Schauberger. *Bautechnik*, vol. 11, nos. 37, and 38, Sept. 1, 1933, pp. 507–509, and Sept. 8, pp. 518–520. Study of economics of tar impregnation of pine-wood mooring piles and similar wooden harbor structures by Rueping process.

ROADS AND STREETS

BITUMINOUS. Critical Examination of Bitumen Road Materials, E. Neumann. *Surveyor*, vol. 84, no. 2183, Nov. 24, 1933, pp. 475–478. Review of German methods of testing bituminous road materials for resistance to compression, impact resistance, stability, tensile strength, resistance to impression, plunger pressure, compressibility. Before Soc. Chem. Industry at Pub. Works, Roads, and Transport Congress.

BRICK. Bases, Bedding, and Fillers for Brick Pavements. *Am. City*, vol. 48, no. 12, Dec. 1933, pp. 50–53. Abstract of report of Committee on Brick Pavements of American Road Builders' Association; bases; bedding courses; rolling; fillers; relaying used brick; maintenance.

COAL TAR. Note sur un appareil de laboratoire destiné a la distillation fractionnée des goudrons pour routes, J. Malette. *Chimie et Industrie*, vol. 29, no. 6 (Special Number) June 1933, pp. 851 and 852. Laboratory apparatus for fractional distillation of road tar; apparatus for distillation test described.

CONCRETE. Device for Forcing Displaced Slabs Into Position. *Roads and Streets*, vol. 76, no. 11, Nov. 1933, p. 394. Pavement jacking assembly for restoring to position concrete slabs, weighing 50 tons, displaced by earthquake of March 10, 1933, in Orange County, California.

CONSTRUCTION. Placing Sand Asphalt with Spreader Plow. *Contractors and Engrs. Monthly*, vol. 27, no. 6, Dec. 1933, pp. 23–25. Construction of 3.6 miles of 24-ft bituminous concrete paving on Hyannis cut-off in Massachussetts; spreader plow handled work admirably; rough grading on Hyannis cut-off; form work; curbing for traffic circle.

MACADAM. Grout Flow in Cement-Bound Macadam. *Roads and Streets*, vol. 76, no. 12, Dec. 1933, pp. 453 and 456. Description of "flow cone" measuring fluidity under variable conditions, as well as approximate flow under actual working conditions; characteristics of grouts; effect of excess water.

MAINTENANCE AND REPAIR. Winter Maintenance and Ice Control on Highways, E. J. Vaughn. *Roads and Streets*, vol. 76, no. 12, Dec. 1933, pp. 438–440. Use of calcium chloride for ice removal; preventing sand stock piles from freezing; studies of scaling.

MATERIALS, SPECIFICATIONS. Road Materials. *Am. Soc. Testing Matls.—Tentative Standards (Issued Annually)*, 1933, pp. 582–660. Tentative

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NON-SKID. Skidding Characteristics of Various Road Surfaces, K. W. Stinson. *Brick and Clay Rec.*, vol. 83, no. 5, Nov. 1933, pp. 159 and 160. Results of investigation carried on at Engineering Experiment Station of Ohio State University; tests show that vertical fiber brick, new and with no asphalt on top, gives good skidding surface. Before Ohio Cement Industries Assn.

RAILROAD CROSSINGS, ELIMINATION. Long Island Is Completing Another Large Grade Separation Project. *Ry. Age*, vol. 95, no. 17, Oct. 21, 1933, pp. 550–553. Project being completed at Valley Stream, N.Y.; extending over a track distance of 7,640 ft on the main line of the Montauk division and over 6,500 ft on two of its branches; wall-retained embankment, viaduct, and bridge structures required placing of 25,000 cu yd of fill, 55,000 cu yd of concrete, and 12,000 tons of structural steel.

RELOCATION. Mountain Road Relocation Based on Traffic Analysis, S. V. Cortelyou. *Eng. News-Rec.*, vol. 111, no. 23, Dec. 7, 1933, pp. 678–681. Features of $3,000,000 relocation of Ridge Route from Los Angeles to Bakersfield, Calif.; comparison with highway standards of 16 years ago; economics of improvement analyzed; stream realignment to avoid two bridges; heavy grading; fill construction.

ROAD MACHINERY. Public Works, Roads, and Transport Congress and Exhibition. *Surveyor*, vol. 84, nos. 2181 and 2182, Nov. 10, 1933, pp. 403–423, and Nov. 17, pp. 447–452. Features of British exhibits of materials, machinery, and apparatus for construction and maintenance of roads and other public works.

SIGNALS AND SIGNALING. Crossing Protection on N.Y. and L.B., F. W. Bender. *Ry. Signaling*, vol. 26, no. 12, Dec. 1933, p. 321. Flashing-light signals operated by a-c with primary-battery stand-by.

SNOW REMOVAL. Keeping the King's Highways Open in Winter in Ontario, W. L. Saunders. *Can. Engr.*, vol. 65, no. 24, Dec. 12. 1933, pp. 5–9. Review of modern Canadian practice; drifts prevented by use of snow fences; highway department uses trucks with V-plows attached; organization of snow removal forces; stockpiles of sand maintained along roads. Before Can. Good Roads Assn.

STREET LIGHTING, GAS. Lighting of Arterial Roads with Gas, A. M. Bell. *Illum. Engr.*, vol. 26, Dec. 1933, pp. 307–309 (discussion) 309–311. Paper before Inst. Gas Engrs. and Assn. Pub. Lighting Engrs. at Pub. Works, Roads, and Transport Congress, previously indexed from *Surveyor*, Nov. 17, 1933.

SEWERAGE AND SEWAGE DISPOSAL

AURORA, ILL. Improving Settling Tank Efficiencies and Lowering Operating Costs at Aurora, Ill., W. A. Sperry. *Water Works and Sewerage*, vol. 80, no. 12, Dec. 1933, pp. 440–442. Description of improvements in separate sludge-digestion plant designed to serve a population of 67,000; results of influent baffling.

CHEMICAL PROCESS. Chemical Treatment of Sewage for Birmingham, Ala., H. H. Hendon. *Water Works and Sewerage*, vol. 80, no. 12, Dec. 1933, pp. 427–430. Flexible plant designed to serve as chemical-precipitation or separate sludge-digestion plant, at will, for sedimentation only during winter and more refined treatment during summer months; filtration of effluent.

FILTERS, TRICKLING. Beitrag zur Klaerung der Vorgaenge bei der biologischen Reinigung von Abwasser in Tropfkoerpern, H. Blunk. *Gesundheits-Ingenieur*, vol. 56, nos. 36 and 37, Sept. 9, 1933, pp. 425–429, and Sept. 16, pp. 440–443. Study of fundamental processes in biological disposal of sewage by means of activated-sludge procedure and trickling filters, based on experimental work at German sewage-disposal plants; texture of trickling filter material; effect of heat on development of micro-organisms and disintegration of organic matter in sewage.

DISPOSAL PLANTS, OPERATION. Sewage-Treatment Costs at Thirty Illinois Plants, W H. Wisely and H. F. Ferguson. *Eng. News-Rec.*, vol 111, no. 26, Dec. 28, 1933, pp. 780–782. Results of study of costs of operation of activated-sludge, sprinkling-filter, and sand-filter plants; operation costs found to be affected greatly by local conditions, such as cost of power, plant load, and type of sewage treated.

GREAT BRITAIN. Wandle Valley Sewage Disposal. *Engineer*, vol. 156, no. 4066, Dec. 15, 1933, p. 592, figs. on p. 596. Extensions provide for treating additional quantity of sewage amounting to 2 million gal per day; plant installed at pumping station includes six centrifugal pumps.

SEWAGE ANALYSIS. Zur Bestimmung des Wassergehaltes im Klaerschlamm, H. Bach. *Gesundheits-Ingenieur*, vol 56, no. 35, Sept. 2, 1933, pp. 417 and 418. Report from Emschergenossenschaft chemical laboratory on methods of determining water content of sewage sludge.

SEWAGE DISPOSAL PLANTS, DESIGN. Designing and Operating Small Sewage Plant, L. J. Arthur. *Eng. News-Rec.*, vol. 111, no. 22, Nov. 30, 1933, pp. 645–648. Salient features of design and results of operation of modern plant for treating sewage from a girls' school in Indiana, housing about 500 persons.

SEWERS, CONCRETE. Seawall Sewer of Concrete Has Vitrified Clay Lining, J. C. Hyde. *Construction Methods*, vol. 15, no. 10, Oct. 1933, pp. 24 and 25. Construction of concrete seawall with integral intercepting sewer 22,546 ft long at Lock and Dam No. 15, Mississippi River, at Rock Island, Ill.; inverts and sidewalls, to height of 5 ft 8 in., are lined with vitrified clay sewer lining, conforming to requirements of A.S.T.M. standard specifications.

SLUDGE. Cost of Drying Sludge on Sand Beds, D. F. Irving. *Water Works and Sewerage*, vol. 80, no. 11, Nov. 1933, pp. 403 and 404. Survey of recorded costs incurred by well-operated plants of various sizes in different parts of the United States where sludge digestion and dewatering on sand beds is practiced; procedure followed in computing costs; future of sludge disposal. Bibliography.

STREAM POLLUTION, FISH LIFE. Sewage Treatment and Fish Life, C. L. Hubbs. *Sewage Works Journal*, vol. 5, no. 6, Nov. 1933, pp. 1033–1040. Effect of sewage disposal in natural streams and lakes on fish life; lack of scientific basis for fixing legal limit for pollution in terms of dissolved oxygen content, bio-chemical oxygen demand or any other single, simple test; dovetailing of fishing, recreational, health, and economic interests, as affected by sewage, treated and untreated. Before Mech. Sewage Works Assn.

TESTING SEWERS. Sewers Tested for Tightness by Measuring Outward Leakage, H. R. F. Helland. *Eng. News-Rec.*, vol. 111, no. 22, Nov. 30, 1933, p. 659. Leakage tests on 63.9 miles of sanitary sewers constructed in Austin, Tex., during 1929, 1930, and 1931.

STRUCTURAL ENGINEERING

ARCHES, STRESSES. Hydrostatic Analogy for Arch Structures, H. M. Westergaard. *Eng. News-Rec.*, vol. 111, no. 26, Dec. 28, 1933, pp. 788 and 789. Method of determining moments and deflections of arches through flotation of properly shaped model.

BEAMS, STEEL. Flexural Strength of Short Beams, W. M. Wilson and G. E. Jewett. *Am. Ry. Eng. Assn.—Bul.*, vol. 35, no. 357, July 1933, pp. 1–10. Results of tests made to determine relative strength in flexure of short and long beams of same section of same steel; two series of tests made, for rectangular and for circular beams; description of apparatus; tables and graphs.

TUNNELS

RAILROAD, COLOMBIA. Construction of La Quiebra Tunnel, Colombia, S.A., C.E. Fraser. *Eng. Journal*, vol. 16, no. 12, Dec. 1933, pp. 510–519. Construction of single-track railroad tunnel passing through the central range of the Andes in Colombia, at an elevation of over 4,000 ft; length, 12,250 ft; problems arising in transporting men and equipment; labor situation as affecting work of contractor; construction equipment; 1,000-kva hydro-electric plant; methods adopted in driving, timbering, and lining; commercial woods found in Nus Valley. Before Eng. Inst. Canada.

VEHICULAR, BELGIUM. Note sur la géologie des terrains traversés par les tunnels sous l'Escaut à Anvers, P. Fourmarier. *Revue Universelle des Mines*, vol. 76, no. 23, Dec. 1, 1933, pp. 621 and 622. Brief note on geology of soils traversed by vehicular tunnel under the Scheldt River at Antwerp.

WATER SUPPLY. Colorado River Aqueduct Tunnel Progress, A. G. Darwin. *Western Construction News and Highways Bldr.*, vol. 8, no. 17, Nov. 1, 1933, pp. 463–468. Progress report; by October 15, more than 3 miles of main tunnel were driven; by October 3, first of 29 tunnels in transmission system were holed through; construction equipment and supplies.

WATER RESOURCES

UNDERGROUND, EGYPT. Das Grundwasser in Aegypten, E. Prinz. *Gas u Wasserfach*, vol. 76, no. 35, Sept. 2, 1933, pp. 660–662. Geology and hydrology of underground water supply of Nile River Valley; records of underground water levels for 1908.

WATER TREATMENT

BACTERIOLOGY. Current Research in Water Bacteriology, J. F. Norton. *Am. Water Works Assn.—Journal*, vol. 25, no. 11, Nov. 1933, pp. 1473–1481. Review of recent research in water bacteriology, particularly detection of coli-aerogenes group in raw and finished water supplies; brilliant green bile as confirmatory medium; comparison of buffered broth and standard lactose broth; differentiation of coli-aerogenes group. Bibliography.

CHICAGO, ILL. Proposed Plan for Ammonia-Chlorine Treatment in Chicago, A. E. Gorman and H. H. Gerstein. *Am. Water Works Assn.—Journal*, vol. 25, no. 11, Nov. 1933, pp. 1482–1489. Description of project, object of which is to give city increased public health protection on South Side, pending decision on part of City Council to filter water supply; cost of operation of ammonia-chlorine treatment at South Side cribs as compared with chlorination at three pumping stations.

CHLORINATION. Tastes, Chlorine, and Chloramines in Water Purification, C. H. Capen, Jr. *Water Works and Sewerage*, vol. 80, no. 12, Dec 1933, pp. 447–450. Classification of tastes; chlorine terminology; relation of chlorine to tastes; temperature effects. Bibliography.

COAGULATION. Floc Formation Studies in Water Purification, A. G. Nolte and W. A. Kramer. *Indus. and Eng Chemistry*, vol. 25, no. 10, Oct. 1933, pp. 1110–1112. Relation of hydrogen-ion concentration to six common coagulants used in water purification, on the basis of experience at the Chain of Rocks plant of the St. Louis Water Division. Bibliography.

FILTRATION PLANTS, OPERATION. Filter Sand Maintenance, F. W. Herring. *Am. Water Works Assn.—Journal*, vol. 25, no 9, Sept. 1933, pp. 1234-1237. Review of practices for maintaining healthy conditions in sand filters.

IRON REMOVAL. Advances in Iron Coagulation and Coagulants, E. L. Bean. *New England Water Works Assn.—Journal*, vol. 47, no. 3, Sept. 1933, pp. 273–279. Review of development of present-day practice; application of iron salts to alkaline, soft, and colored waters; adaptability of ferric iron coagulants. Bibliography.

LIME. Water Purification by Excess-Lime Process. *Indus. Chemist*, vol. 9, no. 105, Oct. 1933, pp. 337–342. Methods of purification at Langford works of Southend Waterworks Company; layout of plant and equipment.

ONTARIO. Delicate Floc Formed in Ottawa Water Makes Necessary Plant with Unusual Features, A. D. Stalker. *Water Works Eng.*, vol. 186, no. 23, Nov. 15, 1933, pp. 1143–1146. Special construction and operation practice of Lemieux Island rapid sand purification plant; stilling chambers, mixing and settling basins; no baffles in settling basins; unusual construction of wash water tank; wash water pumps and arrangement of lights; glass screen for operating gallery; stand-by system taking care of power failure. Before Am. Water Works Assn.

PUBLIC CARRIERS. Protection of Water Supplies on Common Carriers in Canada, G. H. Ferguson. *Can. Engr.*, vol. 65, no. 25, Dec. 19, 1933, pp. 9–11 Report covering activities of Public Health Engineering Division in protecting the health of the traveling public and persons engaged in transportation services.

SLUDGE DISPOSAL. Disposal of Sludge at Water Purification and Softening Works of Mahoning Valley Sanitary District, W. H. Dittoe. *Am. Water Works Assn.—Journal*, vol. 25, no. 11, Nov. 1933, pp. 1523–1530, (discussion) 1530–1533. Ponding system for disposal of sludge due to use of lime-soda process for water softening, in district having a population of 190,000.

SOFTENING. Chemistry of Water Softening, R. F. Goudy. *Am. Water Works Assn.—Journal*, vol. 25, no. 9, Sept. 1203–1206. Elementary explanation of chemistry of water softening; excess lime method of water softening; zeolite process.

WATER WORKS ENGINEERING

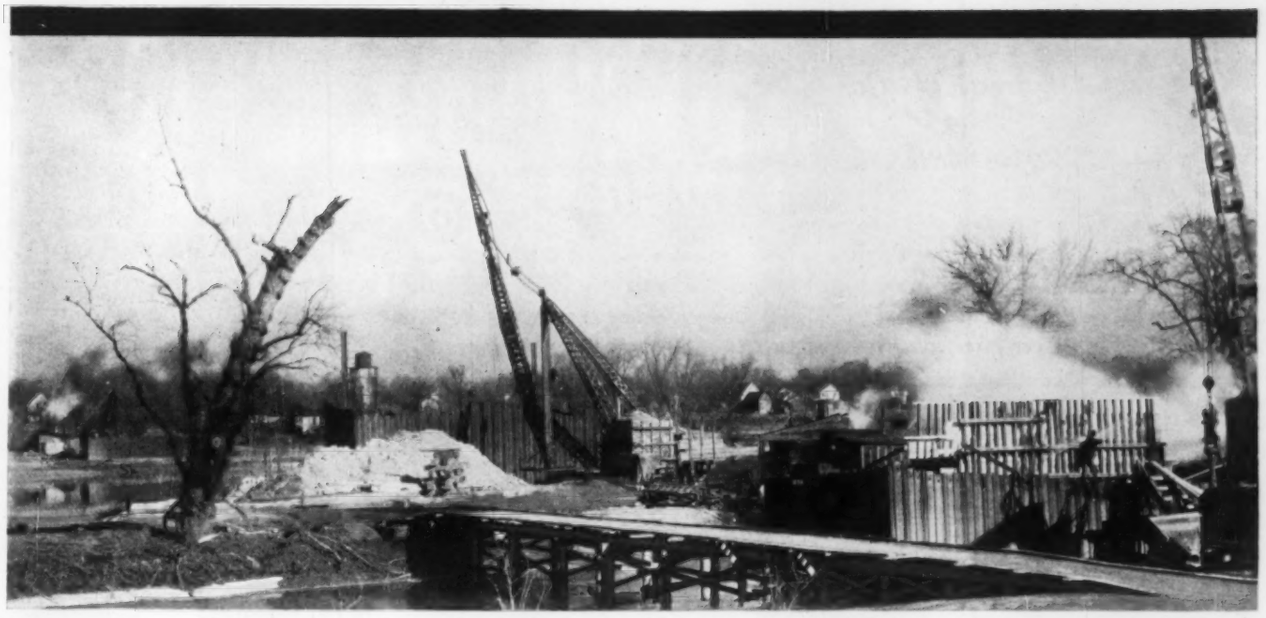
DISTRIBUTION SYSTEMS, OPERATION. Methods of Operation of Bridgeport Water Distribution System, D. H. Hall. *New England Water Works Assn.—Journal*, vol. 47, no. 3, Sept. 1933, pp. 216–218. Operation of water distribution system supplying about 25 mgd to 33,000 services, of which 33 per cent are metered.

FORT WAYNE, MICH. Fort Wayne Completes Its Water Works Plant, R. L. McNamee. *Water Works and Sewerage*, vol. 80, no. 12, Dec. 1933, pp. 421–425. Description of pumping plants and of water treatment equipment for treating well water supply ranging in hardness from 750 ppm; capacity 24 mgd; total cost about $2,500,000; cost of softened water is 5 cents per ton.

JAPAN. Osaka, Japan's Great Industrial Center, Includes Modern Sewage Disposal in Vast Development Program, I. W. Mendelsohn. *Pub. Works*, vol. 64, no. 11, Nov. 1933, pp. 18 and 19. Main features of sewage disposal plant and water supply system serving a population of about 2,500,000.

NEW YORK STATE. Copious Artesian Supply Serves Entire Township, F. J. Keis. *Eng. News-Rec.*, vol. 111, no. 21, Nov. 23, 1933, pp. 627 and 628. Utilization of underground water supply discovered within Latham water district, in Albany County, New York, serving nearly all of Colonie Township; cost of system over $700,000.

WELLS, PLUGGING. Well-Plugging Program Saves Irrigation Water. *Eng. News-Rec.*, vol. 111, no. 20, Nov. 16, 1933, pp. 598 and 599. Beneficial effect of plugging of old leaking wells in Roswell artesian base in New Mexico; basic data for well-plugging operations.



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BRIDGES

CAPE COD CANAL. Three New Bridges for Cape Cod Canal. *Eng. News-Rec.*, vol. 112, no. 4, Jan. 25, 1934, pp. 107–109. Features of Sagamore and Bourne steel-arch highway bridges to be built over Cape Cod Canal, on PWA allotment, consisting of three-span continuous truss with center span of 616 ft and flanking spans of 396 ft; description of vertical-lift railroad bridge over canal, 544 ft center to center of piers, which makes it the longest vertical-lift span yet built; canal improvements.

CONCRETE ARCH, SASKATCHEWAN. Broadway Bridge, Saskatoon, C. J. Mackenzie. *Eng. Journal*, vol. 17, no. 1, Jan. 1934, pp. 3–18. Design and construction of concrete-arch highway bridge consisting principally of five arch spans, 125 to 201 ft in length; details of hinged rockers; cost data; temperatures of concrete; deck expansions; arch deflections; strength of partially cured concrete; pier rotations; horizontal movement of piers during construction. Before Eng. Inst. Canada.

CONCRETE FRAME, QUEBEC. Rigid Concrete Bridge Features of Highway-Railway Separation. *Concrete*, vol. 42, no. 1, Jan. 1934, pp. 5 and 6. Bridge having clear span of 72 ft 6¼ in. and designed for heavy double-track railway loading, carries main line of Canadian National Railways across concrete highway at Vaudreuil, near Montreal; high-frequency vibration employed; design and strength requirements; field tests indicated 7-day strengths averaging around 3,600 lb per sq in.; continuous inspection maintained.

CONCRETE GIRDER. Long Continuous-Girder Bridge of Concrete in Kansas, L. Grover. *Eng. News-Rec.*, vol. 112, no. 4, Jan. 25, 1934, pp. 110 and 111. Channel relocation and construction of five-span concrete-girder highway bridge, 450 ft long, over Big Blue River at Marysville, Kans.; shallow depth at center of spans achieved by use of soffit slabs to resist high negative moments either side of piers; facilities for river-gaging equipment.

DESIGN. Span Ratios in Three-Span Continuous Girder Bridges, R. J. Cornish. *Civ. Eng.* (London), vol. 28, no. 330, Dec. 1933, pp. 441 and 442. Theoretical mathematical discussion of most economical ratio between length of middle span and that of two outer ones.

HIGHWAY, DESIGN. Carichi da considerare nel calcolo dei ponti per strade ordinarie. *Annali dei Lavori Pubblici*, vol. 71, no. 8, Aug. 1933, pp. 665–679. Official Italian specifications as to loads to be considered in the design of ordinary highway bridges; bending moment tables for girders from 3 to 30 m long.

LIFT, JAPAN. Welded Lift Bridge Built in Japan, S. Komuro. *Eng. News-Rec.*, vol. 112, no. 1, Jan. 4, 1934, p. 9. Description of unique structure, with 69-ft span, having trusses of the Vierendeel type, special operating mechanism with counterweights in tower legs, and lifting machinery within one abutment; towers and lift span were welded complete in shop and transported to bridge site on barges.

PLATE GIRDER, DESIGN. Influence Line Diagrams for Portal Girder Bridges, E. C. Smith. *Structural Engr.*, vol. 12, (New Series) no. 1, Jan. 1934, pp. 27–40. Theoretical mathematical discussion leading to construction of influence-line diagram; application to special cases.

PONTOON. Service Tests of Pontoon Equipage, C. K. Harding. *Military Engr.*, vol. 26, no. 145, Jan.-Feb. 1934, pp. 31–38. Service tests, at Fort Benning, Ga., of two types of pontoon equipment, now officially designed "Pontoon Bridge, 7½-ton (Model 1926)" and the "Heavy Pontoon Bridge, 23-ton (Model 1924)"; construction of bridge; loads; ferrying.

PROGRESS REPORT. Bridge Construction in 1933. *Engineer*, vol. 157, no. 4069, Jan. 5, 1934, pp. 23–25, supp. plate. Works of major importance: Golden Gate Bridge, San Francisco harbor; Burrard Bridge, Vancouver; Grey Street Bridge, Brisbane, Australia; bridge construction in India; Khedive Ismail Bridge, Cairo; European bridges; English bridges.

RAILROAD STRESSES. Hammer Blow and Moving-Load Stresses on Railway-Bridges. *Engineering*, vol. 137, no. 3551, Feb. 2, 1934, p. 118. Abstracts of two papers presented before Institution of Civil Engrs.: Hammer-Blow Impact on Main Girders of Railway Bridges, R. W. Foxlee and E. H. Greet; Moving-Load Stresses in Short-Span Railway Bridges, W. E. Gelson.

STEEL. Steel Bridges, M. A. Korni. *Indian Eng.*, vol. 94, nos. 17 and 24, Oct. 21, 1933, pp. 340–342, and Dec. 9, pp. 480 and 481. Evolution of steel bridges of arch-truss and plate-girder types, since middle of nineteenth century.

STEEL ARCH, INDIA. New Bridge over Teesta River, M. S. Davidson. *Indian Eng.*, vol. 94, no. 18, Oct. 28, 1933, pp. 360–363. Design and construction of largest steel-arch bridge of India, consisting of a single span 300 ft long; details of steel trestle, rockers, and cross beams at end of filling wall.

SUSPENSION, FRANCE. Le nouveau ponts suspendu de Serrières sur le Rhône, L. Chadenson. *Genie Civil*, vol. 103, no. 25, Dec. 16, 1933, pp. 585–589. Design and construction of new suspension bridge of 181.2-m span over the Rhone River at Serrier, France; towers are 31 m high; new bridge replaces old two-span suspension bridge built on identical site in 1829.

WELDING. Largest Electrically Welded Bridge in World. *Indian Eng.*, vol. 94, no. 25, Dec. 16, 1933, pp. 500–502 and 504–505. Details of construction of Schlachthof Bridge in Dresden, Germany. Similar in content to article by R. Leonhardt, indexed in Engineering Index 1933, from *Eng. News-Rec.*, Nov. 16, 1933.

BUILDINGS

FLOORS, EARTHQUAKE EFFECT. Earthquake Resistance of Timber Floors, N. B. Green and A. C. Horner. *Eng. News-Rec.*, vol. 112, no. 5, Feb. 1, 1934, pp. 142–145. Report on first part of test program designed to develop facts about range of earthquake resistance possessed by various combinations of wooden floors or roofs and their connections to brick, tile, or concrete walls; load-deflection curves; application of test data.

FOUNDATIONS. Il fabbricato del tribunale misto di Cairo, L. Kambo. *Ingegnere*, vol. 7, no. 12, Dec. 1933, pp. 905–916. Analysis of results obtained by International Commission of Engineers, appointed to make a study of the subsidence of the foundation of the Mixed Tribunal Court Building in Cairo, Egypt; theory of pile foundations and method of computing bearing power of piles.

HIGH BUILDINGS, AIR CONDITIONING. Fan-Motor and Riser-Valve Control in Partially-Air-Conditioned Building, R. C. Allen. *Heating, Piping and Air Conditioning*, vol. 5, no. 12, Dec. 1933, pp. 603–605. Ventilating system used in Gulf Building, Pittsburgh, 40 stories high; results of study of effect of building characteristics on heating and ventilating arrangement.

OFFICE BUILDINGS, PARIS. L'immeuble de la Compagnie de Construction Mécanique, Procédés Sulzer, à Paris. *Génie Civil*, vol. 104, no. 4, Jan. 27, 1933, pp. 77–82. Structural and architectural features of nine-story office building of Compagnie de Construction Mécanique, Procédés Sulzer in Paris; office equipment and appointments.

PRISONS, STEEL CELLS. Modern Prisons Made Breakproof by Special Steels, E. A. France. *Steel*, vol. 94, no. 3, Jan. 15, 1934, pp. 21–23. Examples of special tool-resisting materials and their application to the construction of prison cells.

SUBSIDENCE. Verbessertes Verfahren zur Setzungsbeobachtung, K. v. Terzaghi. *Bautechnik*, vol. 11, no. 41, Sept. 22, 1933, pp. 579–582. Improved method for observing settlement of buildings, bridge piers, and similar structures cost data.

CITY AND REGIONAL PLANNING

AKRON, OHIO. Akron's Building Line Plan, C. F. Fisher. *City Planning—Quarterly*, Jan. 1934, pp. 7–18. Adoption by Akron, Ohio, of building line plan as part of zoning ordinance; maps and provisions; operation and administration; legality sustained; advantages to abutters; effect on thoroughfare system; legality of plan.

SLUMS. Housing and Slum Clearance, W. M. Fraser. *Surveyor*, vol. 85, no. 2189, Jan. 5, 1934, pp. 11 and 12. New policies in Great Britain; improvement areas; standard of accommodation; life of houses. Before Roy. Sanitary Inst.

CONCRETE

AGGREGATES, BULKING. Bulking of Sand, L. I. Cox. *Inst. Engrs. Australia—Journal*, vol. 5, no. 12, Dec. 1933, pp. 419–424. Work carried out in laboratory of Adelaide University to give more detailed knowledge of bulking, with particular reference to local sands, also methods for calculation of bulking and correction of concrete mixed in field; variation in volume of sand due to method of filling measuring receptacle; influence of moisture; microscopic examination of sands; effect of grain size on bulking; bulking curves; relationship between sieve analysis and bulking.

ANALYSIS. Determining Silt Content in Concrete Aggregates, D. T. M. Davis. *Eng. News-Rec.*, vol. 112, no. 2, Jan. 11, 1934, p. 53. Method adaptable to permanent laboratories or to field work where water-cement-ratio methods are used.

COLD WEATHER. Guide to Winter Concreting, F. R. McMillan. *Eng. News-Rec.*, vol. 112, no. 5, Feb. 1, 1934, p. 146. Tests made by research laboratory of Portland Cement Association, showing strength of concrete under conditions approximating those encountered when placing concrete in cold weather; relative strength of concrete as influenced by storage temperatures; suggested rule for ordinary practice.

CONSTRUCTION. Concrete Surfaces. *Concrete Bldg. and Concrete Products*, vol. 9, no. 1, Jan. 1934, pp. 14 and 16. Method of obtaining clean faces on work in situ; effect of temperature changes on production of cracks.

HARDENING. Analysis of Rise in Temperature During Hardening of Concrete, F. Vogt. *Kgl. Norske Videnskabers Selskabs Skrifter* 1933, no. 3. Trondheim, I Kommission Hos F. Bruns Bokhandel, 47 pp. Mathematical study of heat evolution of cement; temperature rise for concrete poured all at once; differential equation and boundary conditions; temperature rise for concrete poured in layers; examples. Bibliography. (In English.)

MIXING. Coordination of Basic Principles of Concrete Mixtures—XIII, J. A. Kitts. *Concrete*, vol. 42, no. 2, Feb. 1934, pp. 13–16. Supplementary principles and coordination; study of criteria of mixtures for skilled control of concrete; law of cement content amplified. (Continuation of serial indexed in Engineering Index, 1932 and 1933.)

PROGRESS REPORT. Concrete Industry Prepared for 1934. *Concrete*, vol. 42, no. 2, Feb. 1934, pp. 3 and 4. New types of cement coming to the fore; heavy-duty concrete pump a new factor in job distribution; vibration gains general acceptance; rigid-frame concrete bridges; earthquake popularizes monolithic concrete.

RESERVOIRS. Mill Rock Reservoir, J. C. Beach. *Conn. Soc. Civ. Engrs.—Annual Report*, issued July 1933, pp. 105–114. Construction of distribution reservoir for the New Haven Water Company, consisting of two circular concrete basins, each 200 ft in diameter and 20 ft deep, forming in plan, a figure "8."

SPECIFICATIONS. Reinforced Concrete in Buildings. *Surveyor*, vol. 85, no. 2190, Jan. 12, 1934, pp. 25 and 26. Abstract of recently pub-

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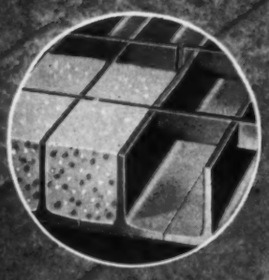

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lished report of the Reinforced Concrete Structures Committee of the Building Research Board of Great Britain, containing recommendations for rules of practice embodying the best available technical information and experience; three grades of concrete allowed; steel; creep of concrete; elimination of formulas.

TEMPERATURE EFFECT. Temperature Rise in Hydrating Concrete, N. Davey and E. N. Fox. (*Great Britain*) *Dept. Sci. and Indus. Research—Bldg. Research*, no. 15, Oct. 1933, 69 pp. Price 1*s* 3*d*. Various factors analyzed and laboratory method given for measuring rise under conditions which simulate those of practice; practical considerations arising from temperature effects; observations on range of important structures, dams, bridges, walls, and slabs, erected in different parts of world; mathematical theory to check laboratory method.

TESTING. Test on Methods of Pouring Under-Water Concrete, A. G. Hampton. *Eng. News-Rec.*, vol. 112, no. 1, Jan. 4, 1934, p. 17. Tests of three methods of pouring: (1) with dump bucket; (2) with tremie, using usual methods of charging; and (3) with tremie, which was charged before submerging.

SAND AND GRAVEL PLANTS, ILLINOIS. New Peoria Gravel Plant Completed Just in Time to Profit by Repeal, E. J. Patton. *Pit and Quarry*, vol. 26, no. 7, Jan. 1934, pp. 31–34 and 76. Design and operation of plant, which forms complete unit with existing storage and central-mixing plants.

VIBRATING. Les ameliorations apportées au béton par l'emploi de la pervibration, J. Lebelle. *Génie Civil*, vol. 104, no. 1, Jan. 6, 1934, pp. 21 and 22. Review of recent European and American research on the effect of vibration on properties of concrete.

DAMS

BOULDER DAM PROJECT, REFRIGERATION. Refrigeration at Hoover Dam, H. N. Royden. *Ice and Refrig.*, vol. 86, no. 2, Feb. 1934, pp. 85–88. Method used to cool concrete in erection of huge hydraulic engineering project; history of Colorado River and Boulder Dam; pipes laid as concrete is poured; method of circulating pre-cooled water; measuring temperature of circulating water and concrete.

CONCRETE GRAVITY, AUSTRALIA. Design of Canning Dam, R. J. Dumas. *Inst. Engrs. Australia—Journal*, vol. 5, no. 12, Dec. 1933, pp. 405–407. Discussion by H. H. Dare of paper previously indexed from issue of Sept. 1933.

EARTH, SPECIFICATIONS. Agency Valley Dam. *U. S. Bur. Reclamation—Specifications*, no. 560, 1934, 48 pp., 24 supp. plates. $2. Schedule, specifications, and drawings of Agency Valley dam, Vale Project, Oregon; dam is of rolled earth-fill type; 90 ft maximum height; 1,500 ft long.

GERMANY. Die Saidenbach-Talsperre der Stadt Chemnitz, A. F. Meyer. *VDI Zeit.*, vol. 77, no. 51, Dec. 23, 1933, pp. 1351–1354. Design and construction of a concrete gravity dam, 58.5 m maximum height, forming a water supply reservoir for the city of Chemnitz; capacity of 22,400,000 cu m; details of spillway and wasteway having concrete blocks for the decreasing of water velocity; cost of dam was 21,500,000 marks.

GRAVITY, DESIGN. Sui muri dritti di ritenuta d'acqua, L. Gherardelli, G. Orecchia and I. Gajone. *Annali dei Lavori Pubblici*, vol. 71, no. 7, July 1933, pp. 593–608. Discussion of Conti formula for the design of straight gravity dams; illustrated examples worked out in detail; numerical tables.

FOUNDATIONS. Strengthening Dam Foundations, J. Roviti. *Min. Mag.*, vol. 49, no. 6, Dec. 1933, pp. 341–349. Description of diamond-drilling and grouting operations carried out in the course of constructing the Marathon Dam for the Athens, Piraeus, and Environs Water Supply Works.

INDIA. Mettur Dam Progress of Construction. *Indian Eng.*, vol. 104, no. 27, Dec. 30, 1933, pp. 540–542. Progress report on the construction of a concrete-gravity dam 5,300 ft long, having a maximum height, at its deepest foundation, of 214 ft; list of expenditures.

FLOOD CONTROL

CALIFORNIA. Los Angeles Flood Damage Due to Torrential Rain. *Eng. News-Rec.*, vol. 112, no. 2, Jan. 11, 1934, pp. 51–53. Report on downpour of 12 in. in 35 hours in fire-swept foothill area responsible for floods that cost nearly 50 lives; debris flow; flood-control plans for foothill region.

FLOOD DISCHARGE. Problem of River Floods and Relation Between River Height and Rainfall, A. J. Bamford. *Surveyor*, vol. 84, no. 2185, Dec. 8, 1933, p. 537. Discussion of rough working formula connecting river height with rainfall without involving determination of absolute discharge; work on river Kelani in Ceylon is used as demonstration model. Before Inst. Civ. Engrs.

FOUNDATIONS

PILES, BEARING POWER. Foundations, G. B. R. Pimm. *Structural Engr.*, vol. 12, (New Series) no. 1, Jan. 1934, pp. 41–47. Critical review of some well-known pile driving formulas. Presented before Inst. Structural Engrs.

RETAINING WALLS, EARTH PRESSURE. Large Retaining-Wall Tests. I—Pressure of Dry Sand, K. Terzaghi. *Eng. News-Rec.*, vol. 112, no. 5, Feb. 1, 1934, pp. 136–140. First of series of five papers on fundamental results, covering the effect on earth pressure of wall movement through entire range up to yield sufficient to produce slip; wall friction and height of center of pressure of dry sand in relation to yield of wall and compaction of fill; internal friction of sand; wall-pressure effects of moving wall toward backfill and then reversing movement; change of hydrostatic ratio with movement of wall.

HYDRAULIC ENGINEERING

EDUCATION. Course in Mechanics of Fluids, H. L. Mason. *Journal Eng. Education*, vol. 24, no. 4, Dec. 1933, pp. 299–302. Course for widening field of knowledge and meeting rapidly changing conditions, which is a part of the larger program initiated for the Mechanical Engineering Department of the Columbia School of Engineering.

HYDRAULIC GATES, DISCHARGE. Discharge Coefficients for Tainter Gates, R. E. Horton. *Eng. News-Rec.*, vol. 112, no. 1, Jan. 4, 1934, pp. 10–12. Theoretical expression for discharge coefficient of "ideal sluice-gate" used as a base for determining coefficient for tainter gate; coefficients so computed agree with those determined experimentally; comparison of Ripley's tainter-gate discharge coefficient with Koch-Carstanjen's coefficient and Horton formula. Bibliography.

HYDRO-ELECTRIC POWER PLANTS

GERMANY. Grundablass und Kraftwerk des Staubeckens Ottmachau, Moehlmann. *Bautechnik*, vol. 11, no. 40, Sept. 19, 1933, pp. 531–542. Reinforced-concrete outlet structure for Ottmachau reservoir in Germany; conservative capacity of outlet is 500 cu m per sec; details of hydro-electric power plant, which in connection with outlet will take care, if necessary, of an additional 35 cu m per sec; sluice gates; geology of site.

HYDROLOGY, METEOROLOGY, AND SEISMOGRAPHY

EARTHQUAKES. Earthquake in Japan Affects Tide Gage in Golden Gate at San Francisco, *Eng. News-Rec.*, vol. 112, no. 5, Feb. 1, 1934, p. 146. Record of Japanese earthquake of March 3, 1933, on tide gage at San Francisco, drawing attention to the fact that seismic shocks travel long distances across bodies of water in the form of stationary waves or seismic sea waves.

INLAND WATERWAYS

CANAL LOCKS, CONCRETE. Lock Concrete Placed by Pumping. *Eng. News-Rec.*, vol. 112, no. 4, Jan. 25, 1934, pp. 101–105. Method of pumping 110,000 cu yd of concrete for building locks 4 and 5 for improvement of Upper Mississippi River slackwater navigation; locks located 90 miles below St. Paul, Minn.; plant layout; concreting procedure; performance records; diagrams of four pumping arrangements.

CAPE COD. Port of Boston and Cape Cod Canal, F. S. Davis. *Mar. News*, vol. 20, no. 8, Jan. 1934, pp. 29, 30, 32–34, 36, and 38–42. Their historical, commercial, and physical advantages.

IRRIGATION

UNITED STATES. Irrigation Requirements of Arid and Semiarid Lands of Pacific Slope Basins, S. Fortier and A. A. Young. *U. S. Dept. Agriculture—Tech. Bul.*, no. 379, Sept. 1933, pp. 1–69. Soils of Pacific slope basins; climatic conditions; river basins and water resources; irrigation practice; crops grown under irrigation; relation of water to crop yield; water requirements of alfalfa, cereals, rice, cotton, and vegetables; tank experiments; experiments with pear, citrus, and walnut trees; duty of water as affected by State, community, and corporate regulations; reclamation of arable lands.

LAND RECLAMATION AND DRAINAGE

DRAINAGE. Land Drainage in England and Holland, W. H. Haile. *Inst. Mun. and County Engrs.—Journal*, vol. 60, no. 14, Jan. 2, 1934, pp. 1024–1032 (discussion) 1033–1035. Discussion of British Land Drainage Act of 1930 and description of several modern drainage projects in Great Britain; features of Zuider Zee reclamation in Holland.

PORTS AND MARITIME STRUCTURES

BOSTON. Port of Boston and Cape Cod Canal, F. S. Davis. *Mar. News*, vol. 20, no. 8, Jan. 1934, pp. 29–30, 32–34, 36, and 38–42. Their historical, commercial, and physical advantages.

BREAKWATERS, STEEL. Developments in Steel Breakwaters, W. G. Caples. *Military Engr.*, vol. 26, no. 145, Jan.-Feb. 1934, pp. 39–41. Development of steel breakwater practice in 1933 and 1934 in Chicago districts; plan and sections of Calumet breakwater.

DOCKS, LIGHTING. Lighting of Docks, J. S. Preston. *Illum. Engr.*, vol. 28, Feb. 1934, pp. 39–45 (discussion) 45. General principles and solutions of various special problems encountered; spacing and choice of fittings, maintenance and efficiency, glare, effects of whitening interior and exterior sites discussed; physiological and psychological aspects of good lighting. Before Illum. Eng. Soc.

GENOA, ITALY. Port of Genoa, Italy. *Naut. Gaz.*, vol. 124, no. 1, Jan 6, 1934, pp. 7–11. Historical review; plan of works, partly accomplished and partly in construction; Benito Mussolini Dock, to be completed in 1935; port distributes merchandise received by sea over territory inhabited by nearly 11,000,000 people and is connected with all the principal ports of the world.

LONDON. Port of London. *Naut. Gaz.*, vol. 124, no. 3, Feb. 3, 1934, pp. 6–10. Business and activities of vessels, which sail in and out of port; indication of general and specialized accommodations; plants and facilities provided for them and for their cargoes; analysis of figures of shipping, entering, and leaving port.

STOCKHOLM. Port of Stockholm, Sweden. *Naut. Gaz.*, vol. 124, no. 2, Jan. 20, 1934, pp. 6–9. Built and owned by city; historical review; chief articles of export; details of Customs Harbor and Free Port, two main parts of which port is composed.

TRAIN FERRIES, JAPAN. Nanking-Pukow Train Ferry. *Shipbldg. and Shipg. Rec.*, vol. 42, no. 25, Dec. 21, 1933, pp. 596 and 597. Details of bridge approaches for Tyne-built steamship "Changkiang" with provision for adjustment to suit river level variation of 25 ft; similar description indexed in Engineering Index 1933 from *Ry. Gaz.*, Dec. 15, 1933.

RAILROADS, STATIONS, AND TERMINALS

CHICAGO. Lakefront Passenger Terminal for Chicago Railroads. *Eng. News-Rec.*, vol. 112, no. 4, Jan. 25, 1934, pp. 112 and 113. Proposal to remove impediment to southward expansion of Loop District by consolidation of all passenger services of several depots south of district in new station adjoining East Randolph Street near lakefront; savings and costs.

ROADS AND STREETS

ANTIQUITY. Great Paved Roads of Mayan Civilization. *Eng. News-Rec.*, vol. 112, no. 2, Jan. 11, 1934, p. 47. Results of Carnegie Institution survey of ancient roads of Central Yucatan; method of road construction; probable time of construction; great "white ways." From *Carnegie Inst.—Bul.* Sept. 24, 1933.

ASBESTOS. Mikro-Asbest in der Asphaltindustrie und im Strassenbau, H. Rosenberg. *Petroleum*, vol. 29, no. 45, Nov. 15, 1933, pp. 1–12. Micro-asbestos in asphalt industry and in road building; bitumen mixed with mineral dust; use of micro-asbestos as filler for asphalt-bitumen mixtures; influence of micro-asbestos filler in asphalt road construction.

ASPHALT. Mineral Aggregate for Road Resurfacing Prepared by New Type of Plant. *Pit and Quarry*, vol. 26, no. 7, Jan. 1934, pp. 75 and 76. Production of Sealdrok cold-lay asphalt paving mixture such as is used to resurface brick highway near Dixon, Ill.; continuous process produces 40 tons per hr with labor of only three men; process also covers treatment of stone dust and screenings, which are often waste products at quarries.

BITUMINOUS. Stability Experiments on Asphaltic Paving Mixtures, W. J. Emmons. *Pub. Roads*, vol. 14, no. 11, Jan. 1934, pp. 197–211 and 218. Behavior of bituminous pavement surface mixtures, under controlled traffic, as observed on circular experimental roadways, 180 ft in mean diameter, built by the U. S. Bureau of Public Roads; measurements on longitudinal and internal displacement at various depths; disintegration on blown asphalt sections; relation between aggregate voids, percentage of bitumen and stability; results of roller tests.

CONCRETE. Biology of Concrete Road, L. T. Colburn. *Inst. Mun. and County Engrs.—Journal*, vol. 60, no. 15, Jan. 16, 1934, pp. 1073–1094 (discussion) 1094–1098. General discussion of principles of design, construction, and maintenance of concrete highways.

CURVES. Interdependence of Speed, Radium, and Sight Line, K. Seymour. *Surveyor*, vol. 85, no. 2190, Jan. 12, 1934, pp. 23–25. Principles of design of highway curves with special regard to obstructions, coefficients of adhesion, sight lines, and design of sight lines at curves and junctions.

DESIGN. Notes on Design of Camber for Roads, H. C. Platts. *Surveyor*, vol. 85, no. 2191, Jan. 19, 1934, pp. 47 and 48. Rational design of sloped camber, side-slopes, and curved crown; length of curved crown; ratio of height of crown to road width.

EARTH. Earth as Structural Material with Particular Reference to Road Construction, D. V. Darwin. *Inst. Engrs. Australia—Journal*, vol. 5, no. 12, Dec. 1933, pp. 425–429. Factors in road design; grading classifications; empirical soil tests; mechanical analysis chart; soil constituents; soil classifications; subgrade improvement; further research.

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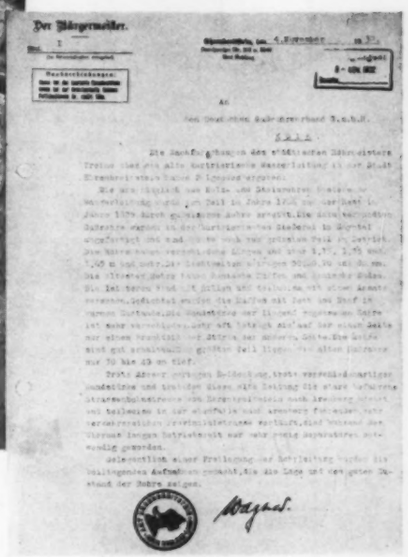

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LOW COST. Laboratory Traffic Test for Low-Cost Road Types, *Pub. Roads*, vol. 14, no. 11, Jan. 1934, pp. 219–222. Description of circular test track, 12 ft in diameter, built at Arlington Experiment Farm, for the study of low-cost bituminous types, which can also be adapted for study of subgrade stabilization, motor-vehicle tire wear, etc.; effect of oil consistency on stability of oiled aggregate surface under test traffic.

MACADAM. Cement-Bound Macadam Brings New Thought on Secondary Roads. *Concrete*, vol. 42, no. 1, Jan. 1934, pp. 9 and 10. Details of three projects in Union County, New Jersey; experimental road supplies engineering data; character of information obtained; high strength attained; economical secondary road type.

MAINTENANCE AND REPAIR. Laboratory Tests Assist in Selection of Materials Suitable for Use in Mud Jack Operations, A. M. Wintermyer. *Pub. Roads*, vol. 14, no. 10, Dec. 1933, pp. 181–184 and 194. Characteristics of suitable materials; tests that will disclose desired characteristics; mechanical device for making liquid-limit test;' laboratory procedure; flow curves of soils tested for suitability for mud jacking; effect of cement admixtures upon shrinkage limit of soil.

RAILROAD CROSSINGS, ELIMINATION. Large Grade Separation Project Completed on Reading. *Ry. Age*, vol. 95, no. 20, Nov. 11, 1933, pp. 688–691. Project on Germantown and Chestnut Hill suburban line, including elevation of two tracks for a distance of 1.8 miles; other improvments; construction of two passenger stations, new local freight-handling facilities, and two long freight lead tracks; work carried out simultaneously with electrification of line, which was handled as separate project; work, exclusive of electrification, cost $1,800,000.

SKIDDING. Why Car Skids. *Motor (London)*; vol. 65, no. 1670, Dec. 26, 1933, pp. 1030 and 1031. How skid commences and develops and ways in which it can be corrected; dangerous road surfaces.

STREET LIGHTING. Modern Developments in Street Lighting. J. M. Waldram. *Surveyor*, vol. 85, no. 2191, Jan. 19, 1934, pp. 49 and 50. Technical problems; direction of recent development; progress in technique; improvements in effectiveness; road-surface brightness; examples of new developments. Presented before Roy. Soc. Arts.

UNITED STATES. Highway Progress Reviewed at A.R.B.A. Convention. *Eng. News-Rec.*, vol. 112, no. 5, Feb. 1, 1934, pp. 147 and 148. Proceedings of 1934 convention of American Road Builders Assn.; progress of $400,000,000 program; express roads and grade-crossings; future Federal aid; CWA operations in engineering and contracting; resolutions.

SEWERAGE AND SEWAGE DISPOSAL

CHEMICAL PROCESS. Chemical Sewage Purification, G. H. Gleason and A. C. Loonam. *Surveyor*, vol. 84, no. 2184, Dec. 1, 1933, pp. 501 and 502. Operation of plant taking care of 28,000 gal per day in Chicago Sanitary District; sludge disposal; regeneration of zeolites; operating details.

GREAT BRITAIN. Petter-engined Sewage Disposal Works. *Gas and Oil Power*, vol. 28, no. 339, Dec. 1933, pp. 318–321 and 323. Details of addition to sewage works at Sealands Road, Chester, England; character of works and sewage treatment; general arrangement of Sealands Road oil-engined pumping station; four Petter atomic Diesel engines, each driving Pulsometer pump through turbine speed-increasing gearing.

SEASHORE. Disposal of Sewage of Seaside Towns, G. M. C. Taylor. *Surveyor*, vol. 85, no. 2190, Jan. 12, 1934, pp. 33–35. Point of discharge; number of outlets; influence of coast line; storage; treatment of solids; chlorination before discharge; "tailings" difficulty; inexperienced contractor; contractor as agent; winter work; supervision. Before Inst. Sanitary Engrs.

SEWAGE DISPOSAL PLANTS, COST ACCOUNTING. Sewage Disposal Works, W. F. Freeborn. *Surveyor*, vol. 84, no. 2186, Dec. 15, 1933, pp. 551 and 552 (discussion) 552 and 553. Cost accounting in relation to control and management; object of cost accounting plant replacement; basis of cost records; value of cost accounts and plant records. Before Inst. Sewage Purification.

SEWERS, DESIGN. Two Recent Examples of Sewage Disposal Works, A. H. S. Waters. *Structural Engr.*, vol. 12, (New Series) no. 1, Jan. 1934, pp. 10–13. Supplementary data to paper by same author entitled: Modern Construction Practice in Sewerage and Sewage Disposal, indexed in Engineering Index 1932, p. 1180, from issue of March 1932.

SLUDGE. Aerobic and Anaerobic Decomposition of Sewage Solids—II and III, H. Heukelekian. *Indus. and Eng. Chem.*, vol. 25, no. 10, Oct. 1933, pp. 1162–1164. Continuation of serial indexed in Engineering Index 1932, p. 1173, from issue of Nov. 1932; effect of seeding with aerated sludge; effect of reversing process after initial stabilization. Bibliography.

TORONTO. Engineers Recommend $25,000,000 Sewage Disposal Works for City of Toronto. *Eng. and Contract Rec.*, vol. 47, no. 48, Nov. 29, 1933, pp. 1083–1087. Abstract of report by Gore, Masmith and Storrie, and Metcalf and Eddy, consulting engineers, appointed in 1931 to study sewage collection and treatment requirements.

UNITED STATES. Ohio Conference on Sewage Treatment. *Water Works and Sewerage*, vol. 80, no. 12, Dec. 1933, pp. 435–439. Record of proceedings of 1933 annual meeting, including abstracts of the following papers: Sewage Disposal as Practiced by German Cities, C. B. Hoover; Operating Results and Costs at Activated Sewage Treatment Plant at Lima, Ohio, W. S. O'Brien; Operating Features of Traveling Trickling Filter Distributors, G. A. Hall; Improved Method of Clarifying Sprinkling Filter Effluents, A. H. Fretter; Findley Sewage Treatment Plant, H. B. Barton.

STRUCTURAL ENGINEERING

COLUMNS, BRICK. Reinforced-Brick Columns, I. Lyse. *Eng. News-Rec.*, vol. 112, no. 1, Jan. 4, 1934, p. 12. Data from 33 test columns indicate that strengths of steel and brickwork are directly additive, assuming steel strength as effective up to yield point; load-deformation diagrams; results of tests of 18 reinforced-brick columns 12½ in. square and 10 ft high.

DOMES, SUSPENDED. Cable-Suspended Dome Roof. *Engineering*, vol. 137, no. 3548, Jan. 12, 1934, p. 52. Roof of Travel and Transport Building at Century of Progress Exposition; circular building 200 ft in diameter with a clear height of 125 ft inside; reasons for adoption of suspended dome; entire roof was erected by means of platforms and boatswain chairs hung from cables.

ROOFS, CONCRETE SHELL. Considérations sur les voutes minces autoportantes et leur calcul, R. Vallette. *Génie Civil*, vol. 104, no. 4, Jan. 27, 1934, pp. 85–88. Theoretical mathematical analysis of stresses, reinforced-concrete vaulted roofs, and barrel arches.

TUNNELS

COLORADO RIVER. Tunnel Progress on Colorado River Aqueduct. *Eng. News-Rec.*, vol. 112, no. 5, Feb. 1, 1934, pp. 131–135. Progress report on construction of tunnel with diameter of 15¼ and 16 ft; 91 miles long; greatest tunneling project of all times; access highways; adits and shafts; tunnel operations; drilling and switching; loading; timbering.

TORONTO, ONT. Clear-Water Tunnel for New Toronto Duplicate Water Supply. *Can. Engr.*, vol. 66, no. 1, Jan. 2, 1934, pp. 7–10. Construction of recently completed water supply tunnel for new duplicate water works for Toronto; tunnel driven through rock is over 10 miles long, diameter ranging from 10 ft to 6 ft; concrete lining of tunnel.

VEHICULAR, BELGIUM. Die Tunnels unter der Schelde in Antwerpen, H. Proetel. *VDI Zeit*, vol. 77, no. 50, Dec. 16, 1933, pp. 1331–1335. Description of tunnels under the Scheldt River in Antwerp, Belgium. Similar in contents to several articles by various authors, indexed in Engineering Index 1933 from various sources.

WATER SUPPLY TUNNELS, VANCOUVER, B.C. Tunnel Built Under Harbor Entrance for Vancouver Water Supply, E. A. Cleveland. *Eng. News-Rec.*, vol. 112, no. 1, Jan. 4, 1934, pp. 1–5. Article on design and construction of concrete-lined pressure tunnel 7.5 ft in diameter and 3,100 ft long, at a depth of 400 ft, similar in contents to several articles indexed in Engineering Index 1933 from various sources.

WATER TREATMENT

AIRPORTS, WATER WORKS. Potabilizzazione delle acque negli aeroporti, A. Andruzzi, G. Ipsevich and M. Gambioli. *Rivista Aeronautica*, vol. 9, no. 12, Dec. 1933, pp. 431–468. Design of water works for airports, with special reference to water softening and other methods of purification; data on water works of several Italian airports.

ALGAE CONTROL. Algal Growths and Water Supply, J. W. Husband. *Water and Water Eng. (Special Inst. No.)*, vol. 35, no. 427, Winter 1933, pp. 765–771, and 773–775, (discussion) 777–780. Experience of Bedford Corporation Water Works, England; preliminary investigation; abnormal pollution (long standing); river silt in suspension in Ouse water; potassium permanganate treatment; continuous successful results of treatment as applied to four storage reservoirs; potassium-permanganate mixing and dosing unit. Before Inst. Water Engrs., Winter Mtg., 1933.

COAGULATION. Formation of Floc by Ferric Coagulants, E. Bartow, A. P. Black and W. E. Sansbury. *Indus. and Eng. Chem.*, vol. 25, no. 8, (Indus. Edition), Aug. 1933, pp. 898–903. Ferrous sulfate as coagulant; comparison of change in pH during precipitation of ferrous and ferric hydroxides by sodium hydroxide; ferric salts as coagulants; effect of various anions of floc formation; experimental procedure. Bibliography.

COPPER SULFATE. Copper Sulfate Treatment Improved by Adding Chemical in Mixing Chambers at Plant, J. K. Marquis. *Water Works Eng.*, vol. 86, no. 26, Dec. 27, 1933, pp. 1284 and 1285. Practice of water plant of Spartanburg, S.C.; since treatment of raw water with copper sulfate in impounding reservoir is impracticable, chemical is added in mixing chambers; method of applying treatment; copper sulfate required for different dosages: effectiveness of method; dosage not injurious to human system.

FILTRATION, GREAT BRITAIN. Mechanical Filtration of Water, E. Minors and C. H. J. Stock. *Surveyor*, vol. 84, no. 2184, Dec. 1, 1933, p. 509. Eight-year experience at Darlington; removal of peaty discoloration; type of filters; removal of color; filter washing; effective filtrations. Before Royal Sanitary Inst.

FLOCCULATORS. Adsorption of Copper Sulfate by Aluminum Floc, C. J. Brockman. *Indus. and Eng. Chem.*, vol. 25, no. 12, Dec. 1933, pp. 1402 and 1403. Effect of copper sulfate, used in algae control, on subsequent flocculation of raw water with aluminum; results of tests of water supply of Athens, Ga., showing that, so long as pH of filtered water remains above 6.3, very heavy dose of copper sulfate may be used, without any danger of copper salt getting through filters in plant using alum treatment method. Bibliography.

GERMANY. Die Wirkungsweise der neuen Schnellfilteranlage der staedtischen Werke Breslau, E. Kirchner. *Gas- und Wasserfach*, vol. 76, no. 41, Oct. 14, 1933, pp. 749–752, (discussion) 752 and 753. Report on operating tests of new rapid filter plant of Breslau, Germany; filter plant has a filtration area of 540 sq m; manganese removal.

SOFTENING, ZEOLITE PROCESS. Automatic Control Instruments Applied to Zeolite Water Softening Process, E. Pick. *Instruments*, vol. 6, no. 12, Dec. 1933, pp. 215–218. Operating principle of fully automatic softener developed by the Permutit Company, New York, N.Y. electric control; main control switch; meter switch; interlock contact; advantages of automatism.

TASTE AND ODOR REMOVAL. Report of Committee on Control of Tastes and Odors in Public Water Supplies, M. E. Flentje. *Am. Water Works Assn.—Journal*, vol. 25, no. 11, Nov. 1933, pp. 1490–1504. Report of Committee of American Water Works Assn. for 1932–1933; list of public water supplies using special treatment for taste and odor control; cooperative study of laboratory methods of taste and odor determination; dilution table for odor determinations; odor values as determined by various persons in terms of dilution numbers; data on use of activated carbon; methods of phenol determination

WAKEFIELD, MASS. Wakefield Water Supply, R. S. Weston. *New England Water Works Assn.—Journal*, vol. 47, no. 3, Sept. 1933, pp. 239–247. Description of water works serving a population of about 17,000; operation of water treatment plant; cost of purification.

WATER WORKS ENGINEERING

GREAT BRITAIN. Lancaster Water Supply. Langthwaite Reservoir, F. Hill. *Water and Water Eng.*, vol. 35, no. 426, Dec. 20, 1933, pp. 695–699. Survey of water works of district; statistical data on growth since 1853, with special reference to the construction of an earth-fill puddle-core dam, having a top water level of 385 ft above sea level, a capacity 190 million gal, and a maximum depth of 40 ft. Before Inst. Mun. and County Engrs.

HYDRANTS. Round Table. *Water Works Eng.*, vol. 86, no. 26, Dec. 27, 1933, pp. 1292–1295. Water superintendents' discussion of methods of installation of hydrants, with special reference to precautions taken in setting hydrants to prevent freezing.

OPERATION. Chicago Learns Importance of Continuous Pressure Records, J. B. Eddy and W. B. Weldon. *Water Works Eng.*, vol. 86, no. 26, Dec. 27, 1933, p. 1297. Starting in 1904, permanent pressure recorders have been installed until they are now uniformly located over the entire city. Presented before Am. Water Works Assn.

UNITED STATES. Meeting of Virginia Water and Sewage Works Association. *Water Works and Sewerage*, vol. 80, no. 12, Dec. 1933, pp. 431–434. Record of proceedings of 1933 annual meeting, including abstracts of the following papers: Newport News Water Supply, J. C. Biggins; Taste and Odor Control Experiences, R. W. Fitzgerald; Consumers' Complaints and Methods of Handling Them, C. C. Massey; Methods of Water Softening, C. P. Hoover. (To be continued.)

WATERSHEDS, FORESTRY. Relation of Forests to Evaporating Power of Air, P. W. Stickel. *New England Water Works Assn.—Journal*, vol. 47, no. 3, Sept. 1933, pp. 229–238. Review of work of Northeastern Forest Experiment Station for period, 1925–1931; effect of forest cover upon water loss from duff and soil; average monthly evaporation in the open and in forests; duff and soil temperatures; effect of forest upon duff and soil temperature. Bibliography.

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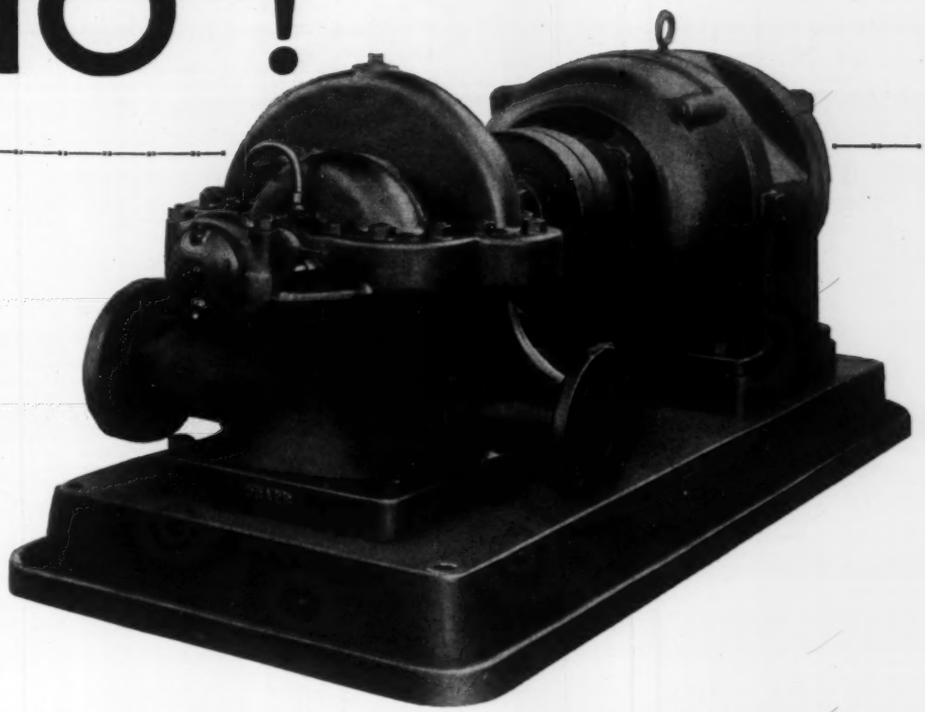

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BRIDGES

CAISSONS, STEEL. Steel Fitted to New Method of Caisson Construction, B. J. Osborne. *Steel*, vol. 94, no. 8, Feb. 19, 1934, pp. 26 and 27. Illustration of steel structure, reputed to be largest caisson ever constructed, launched for pier No. 4; main anchorage for superstructure of San Francisco-Oakland Bridge.

CONCRETE FRAME. Rigid-Frame Concrete Bridges, J. W. Beretta. *Am. Concrete Inst.—Journal*, vol. 5, no. 3, Jan–Feb. 1934, pp. 196–208. Classification of bridges; design and economic problems of short-span bridges; Texas examples of continuous and rigid-frame bridges; future of rigid-frame and continuous concrete design.

CONCRETE TRESTLE. Use Three-Pile Concrete Bents in Railway Trestles, F. E. Bates. *Ry. Age*, vol. 96, no. 6, Feb. 10, 1934, pp. 220–222. Trestle bridges built by Missouri Pacific; use of reinforced-concrete pile bents, using only 3 piles to a bent; to maintain stiffness and load-carrying capacity size of piles was increased from 16 to 24 in.; properties of 16-in. and 24-in. concrete piles; how tests were made; methods used in driving; piles cast at central plant; table giving cost of concrete piles per foot.

DESIGN. Design and Construction of Composite Slab and Girder Bridges, A. W. Knight. *Inst. Engrs. Australia—Journal*, vol. 6, no. 1, Jan. 1934, pp. 10–22. Properties of longitudinal member; reaction influence lines; design of shear reinforcing; construction of composite beam bridges; economics of structure; continuous beam on elastic supports. Appendix by A. Burn.

FLOORS. Introduce New High Strength Structural Aluminum Alloy, E. C. Hartman. *Ry. Age*, vol. 96, no. 8, Feb. 24, 1934, pp. 281 and 282. Product of research conducted at laboratories of Aluminum Company of America and its applicability to bridge construction; weight 174 lb per cu ft; tensile strength 61, 111 lb per sq in.; yield point 49,000 lb per sq in.; elongation in 2 in., 10 per cent; recent application in renewal of floor of bridge over Monongahela River at Pittsburgh.

PLATE GIRDER, DENMARK. Die neue Brueckenverbindung ueber den Limfjord zwischen Aalborg und Noerresundby, F. Bohny. *Bauingenieur*, vol. 14, nos. 41/42 and 43/44, Oct. 13, 1933, pp. 516–521, and Oct. 27, pp. 538–542. Results of competitive design; method of construction of plate-girder highway bridge over Limfjord, between Aalborg and Noerresundby, Denmark; seven spans, including one movable span, totaling 405.3 m in length, exclusive of approaches; width of roadway 8.5 m plus two 3-m sidewalks; launching and sinking of reinforced-concrete pier caissons; total cost 13,000,000 Danish kronen.

QUEBEC. Bridging St. Lawrence at Ile d'Orleans. *Eng. News-Rec.*, vol. 112, no. 11, March 15, 1934, pp. 356–359. Features of new highway crossing in Province of Quebec; 1,059-ft suspension span of prestressed-cable-strand type and offshore anchorages, involving unique design and special construction planning; construction stages for anchorages shown by balsa wood models; towers of bridge consist of two legs with constant core and varying wing sections 218 ft high.

RAILROAD CROSSINGS, FLOORS. Bridge Deck of Wrought Iron Plates. *Ry. Age*, vol. 96, no 9, March 3, 1934, pp. 315 and 316. Construction in which wide-flange beams, covered with $^{5}/_{8}$-in. wrought-iron deck, provide shallow ballasted floor for Missouri Pacific underpass at Little Rock, Ark.

STEEL ARCH, AUSTRALIA. Sydney Harbour Bridge. *Surveyor*, vol. 85, no. 2194, Feb. 9, 1934, pp. 215 and 216. Abstracts of paper to be presented before Institution of Civil Engineers: Design of Structure and Foundations, R. Freeman; Manufacture of Structural Steelwork and Erection of Bridge, R. Freeman and L. Ennis; Calculations for Steel Superstructure, J. F. Pain and G. Roberts.

STEEL TRUSS, RECONSTRUCTION. Reconstruction of Empress Bridge Over River Sutlej on North Western Railway, India, J. D. Watson. *Inst. Civ. Engrs.—Min. Proc.*, vol. 237, no. 4849, 1933, pp. 3–13, 1 supp. sheet. Shortening, widening, and strengthening of old wrought-iron bridge, which consisted of sixteen 257-ft spans; new bridge consists of eight spans of the same length and carries two railroad tracks.

SUSPENSION, SAN DOMINGO. San Rafael Bridge in San Domingo, C. M. Jones. *Eng. News-Rec.*, vol. 112, no 8, Feb. 22, 1934, pp. 249–253. Structural features of recently completed highway suspension bridge, having a span of 450 ft, characterized by open-type prestressed cables, saddles depressed into tops of towers, and floor of interlocking steel channels and mineraled-surface asphalt plank.

VIADUCTS, STEEL. High Railway Viaduct Built at 14,000-Ft Elevation in Andes. *Eng. News-Rec.*, vol. 112, no 7, Feb. 15, 1934, p. 229. Construction of Polvorilla Viaduct on Argentina State Railways, between Salta and Abra Chorillos; 733 ft long; 235 ft high above stream bed; cost $966,771 Argentine paper pesos.

WELDED. Design and Construction of Arc Welded Truss Bridge at Kimberley, Tasmania, R. C. Sharp. *Inst. Engrs. Australia—Journal*, vol. 6, no. 1, Jan. 1934, pp. 3–10. Features of 3-span highway bridge 220 ft long; cost analysis; liability to buckling of top chord of open-type through truss; detail of rocker bearing. Appendix by A. Burn and G. D. Balsille.

BUILDINGS

EXHIBITION BUILDINGS, AIR CONDITIONING. Air Conditioning New Exhibition Hall at Cleveland, P. H. Bryant. *Heating and Vent.*, vol. 30, no. 12, Dec. 1933, pp. 36–40. Heating, ventilating, and air-conditioning equipment of the hall housing the national exhibitions of industrial and trade associations; total volume of building is 4,400,000 cu ft.

RECONSTRUCTION. Reconstruction in Long Beach Following Earthquake, C. D. Wailes, Jr. *Eng. News-Rec.*, vol. 112, no. 8, Feb. 22, 1933, pp. 263–267. Repair methods used on various types of buildings; damage to structural frames; figures on volume of repair work; methods of inspection.

VIBRATIONS, MEASUREMENT. Vibration Meter for Earthquake Studies of Buildings, N. H. Heck. *Eng. News-Rec.*, vol. 112, no. 10, March 8, 1934, p. 315. Features of portable instrument, developed by U. S. Coast and Geodetic Survey, equipped with photographic recorder.

WIND EFFECT. Wind Load on Buildings in Netherlands. *Eng. News-Rec.*, vol. 112, no. 10, March 8, 1934, p. 331. Rules established for wind loading to be used in the design of buildings in the Netherlands; coefficients for external surface of closed buildings; rules for roofs not supported by walls; value of velocity pressure for chimneys.

CITY AND REGIONAL PLANNING

FINANCING. Municipal Credit, F. L. Bird. *Eng. News-Rec.*, vol. 112, no. 6, Feb. 8, 1934, pp. 200 and 201. Appraisal of 1933 developments, which ranged from grave crisis, through Federal help, to substantial improvement in private financing; effects of tax-limit legislation; cities and PWA.

SLUMS. Price of Slum Clearance. *Arch. Forum*, vol. 60, no. 2, Feb. 1934, pp. 154–157. Discussion of rentals, types of housing, land prices, construction costs, and subsidies, with special reference to conditions obtaining in the New York metropolitan area.

TRAFFIC CONTROL. Traffic-Distributing Centers for Triborough Bridge, New York, C. U. Powell. *Eng. News-Rec.*, vol. 112, no. 9, March 1, 1934, pp. 279–281. Plans for sorting and distributing future heavy traffic to and from Long Island over the Triborough Bridge through populous Queens; depressed plaza; complex interchange connection with island parkways.

UNITED STATES. Planning Better Country, C. W. Eliot 2d. *Eng. News-Rec.*, vol. 112, no. 6, Feb. 8, 1934, pp. 202 and 203. Executive officer of U. S. National Planning Board discusses board's program for guiding development of physical, economic, and social requirements, in which Federal Government will cooperate with states and regional authorities; beginnings of regional coordination; providing for continuing growth.

CIVIL ENGINEERING

ILLINOIS. Subjects of Wide Interest Discussed at Illinois State Society Meeting. *Eng. News-Rec.*, vol. 112, no. 8, Feb. 22, 1934, pp. 255–257. Proceedings of the 1933 meeting of the Illinois Society of Engineers, including abstracts of papers on sewage-gas use, sludge costs, beer slop, overload effect, well survey, elbow as meter, pipe tightness, fatigue, and mortar-void theory in practice.

CONCRETE

CANAL LOCKS, CONCRETE CONSTRUCTION. Lock Concreting at Rock Island Dam. *Eng. News-Rec.*, vol. 112, no. 11, March 15, 1934, pp. 341–344. Methods of concrete construction used in building the locks at Rock Island Dam on the Upper Mississippi, occupying an area of 17 acres, including 1 mile of walls 26 ft high; new designs of cofferdams; compaction of concrete by vibration.

CONSTRUCTION. Winter Work Emphasized at Concrete Meeting. *Eng. News-Rec.*, vol. 112, no. 9, March 1, 1934, pp. 294–297. Proceedings of 1934 annual convention of American Concrete Institute in Toronto, including papers on concrete durability, evaluating admixtures, high-silica cements, architectural concrete, construction-joint technique, plastic flow, bridges, precast joist floors, winter concreting, concrete design in France, and Canadian bridges.

DISINTEGRATION. Betonschaeden durch Lagerung von Ammonium sulfat, H. Cantz. *Bauingenieur*, vol. 14, no. 47/48, Nov. 24, 1933, pp. 571–574. Practical observations on the destructive effects of commercial ammonium sulfate on unprotected concrete and on reinforcement bars; results of laboratory tests.

FRANCE. Le beton sec, liquidifié et ses applications, E. Marcotte. *Nature (Paris)*, no. 2917, Nov. 15, 1933, pp. 439–443. Review of modern methods of concrete construction, including previbration and aeration methods and equipment, with special reference to French practice.

MIXING. Alternatives to 1 : n : 2n Proportions for Concrete, H. N. Walsh. *Civ. Eng. (London)*, vol. 29, no. 331, Jan. 1934, pp. 8–11. Grading curves for aggregates of different shapes and maximum sizes; numerical example illustrating use of grading curves.

PLASTICITY. Sur la plasticite des constructions en beton arme, P. Mariani. *Entreprise Française*, vol. 4, no. 37, Jan. 25, 1934, pp. 14–23. Plasticity of reinforced-concrete construction; deformation of concrete and steel; effect of shrinkage on binding and shearing; fissures.

REINFORCEMENT. Application of High Grade Steel in Reinforced Concrete, F. Emperger. *Structural Engr.*, vol. 11 (new series), no. 12, Dec. 1933, pp. 475–477. Revision of methods of concrete design; improvements in the manufacture of concrete and the introduction of Isteg reinforcing bars; construction of diagrams.

SLABS, CRACKING. Der Bruch von Eisenbetonplatten, M. Bergstraesser. *Bauingenieur*, vol. 14, no. 45/46, Nov. 10, 1933, pp. 555–558. Theoretical mathematical analysis of stresses and formation of cracks in square and circular reinforced-concrete slabs.

STRENGTH. Betonfestigkeit im Lichte der neuen physikal ischen Forschung, A. Pogany. *Zement*, vol. 23, nos. 4 and 5, Jan. 25, 1934, pp. 48–50, and Feb. 1, pp. 63–65. Strength of con-

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crete in light of new physica research; review of recent studies and theories advanced; factors governing increase in strength of concrete.

TEMPERATURE EFFECT. Die Erwaermung des Betons beim Erhaerten, etc. *Zement*, vol. 23, no. 6, Feb. 8, 1934, pp. 75 and 76. Heating of concrete with hardening and its influence on strength of concrete; brief reference to studies carried out by Building Research Board in England, as described in Engineering Index, 1933.

TESTING LABORATORIES, AIR CONDITIONING. Air Conditioning's Role in Hoover (Boulder) Dam Construction. *Modern Power and Eng.*, vol. 28, no. 1, Jan. 1934, pp. 17 and 31. Unique application of refrigeration and air conditioning in the U. S. Bureau of Reclamation concrete testing laboratory, Denver, Colo. Similar descriptions indexed in Engineering Index, 1933, from various sources.

TRUSSES. Sulla prova a rottura di una caprlata in conglomerato cementizio armato, L. F. Donato. *Annali dei Lavori Pubblici*, vol. 71, no. 9, Sept. 1933, pp. 808–823, 1 supp. plate. Analysis of tests of triangular reinforced-concrete truss about 7.5 m long, and 2.2 m high.

DAMS

CONSTRUCTION, TENNESSEE. Rapid Progress Made on Construction at Norris Dam. *Eng. News-Rec.*, vol. 112, no. 9, March 1, 1934, pp. 282–284. Preliminary construction operations by Tennessee Valley Authority while design of dam is being developed; cofferdam operations; mixing and placing plant; working conditions; type of employee.

FRANCE. Le réservoir d'Arcizans de l'usine hydroélectrique de Lau-Balagnas (H.-Pyrénées), G. Lejard. *Techniques des Travaux*, vol. 9, no. 12, Dec. 1933, pp. 759–767. Construction of hydroelectric power plant reservoir at Lau-Balagnas plant, province of High Pyrenees, France; capacity of 400,000 cu m; formed by highway and other embankments constructed practically all around its perimeter; water side face of embankment, rising to a maximum height of 14 m, is faced with wire net and gunite revetment; cost 5,000,000 francs.

RESERVOIRS, GREAT BRITAIN. Silent Valley Reservoir, Mourne Mountains, County of Down. *Water and Water Eng.*, vol. 36, no. 429, Feb. 20, 1934, pp. 55–60. Construction of reservoir having a capacity of 3,000,000,000 gal. formed by earth dam 1,500 ft long, with 88-ft maximum height; concrete cut-off wall, 6 ft thick, going down to a maximum depth of 200 ft; photographs of circular bell-mouth shaft spillway.

SPILLWAYS, TUNNEL. Perfectionnements aux évacuateurs de crue souterrains, M. Coyne. *Annales des Ponts et Chaussées (Partie Technique)*, vol. 2, no. 6, Nov.-Dec. 1933, pp. 346–358. Principles of design of large-capacity tunnel spillways, with special reference to model testing in the construction of a twin tunnel spillway for the Mareges Dam, 90 m high, on the Dordogne River, France; each of two spillways is to carry 1,000 cu m per sec, with a maximum velocity of 23 m per sec; details of tunnel inlets.

WEIRS, DISCHARGE. Critical Depth and Instability in Weir Flow, J. R. Whittaker. *Water and Water Eng.*, vol. 36, no. 429, Feb. 20, 1934, pp. 62–65. Summary and discussion of recently published studies, mostly American, of flow of water over weirs. Bibliography.

FLOOD CONTROL

FLOOD DISCHARGE. Analysis of Storm of November 1927, by Rational Method, C. H. MacDougall. *Boston Soc. Civ. Engrs.—Journal*, vol. 20, no. 10, Dec. 1933, pp. 255–266. Study of flood of November 1927 in Vermont and other New England States; development of rational method of flood analysis; computation methods; comparison of absolute and measured peak flows, 1927 storm; application of rational method to flood prediction; probable flood flows in northern Vermont.

LEVEE CONSTRUCTION. Local Flood Protection Rationally Revised, T. Saville and C. E. Ray, Jr. *Eng. News-Rec.*, vol. 112, no. 9, March 1, 1934, pp. 289–291. Old plantation levee on Roanoke River in North Carolina redesigned economically on a basis of determined flood frequency and stream hydrographs; man-hour and cost data.

FOUNDATIONS

ANCHOR PLATES. Bewegung und Kraft bei Ankerplatten, H. Petermann. *Bauingenieur*, vol. 14, no. 43/44, Oct. 27, 1933, pp. 531–536. Testing of mechanical properties of sand and earth foundations; strength and efficiency tests of models of single and multiple anchor plates, also anchor walls; scale law for square anchor plates.

PILES, CONCRETE. Driving Franki Concrete Piles at Berthierville, Que., H. P. Burrell. *Can. Engr.*, vol. 66, no. 4, Jan. 23, 1934, pp. 3–5. Construction of pile foundations for the new Convent for the Dominican Sisters; soil in district is treacherous blue clay, and heavy buildings sink unless supported by piles; diagram of test load on one Franki pile, 25 ft 9 in. long.

RETAINING WALLS, EARTH PRESSURE. Large Retaining-Wall Tests. III—Action of Water Pressure on Fine-Grained Soils. *Eng. News-Rec.*, vol. 112, no. 10, March 8, 1934, pp. 316–318. Coefficient of grain contact; interpretation of rupture diagrams; results of tests and conclusions. Bibliography.

HYDRAULIC ENGINEERING

HYDRAULIC JUMP. Wassersprung in geneigten, sich verbreiternden Gerinnen, K. Safranez. *Bauingenieur*, vol. 14, no. 41/42, Oct. 13, 1933, pp. 521–526. Review of experimental work by A. G. Levy, R. W. Ellms, and J. R. Fleming on hydraulic jump in inclined flaring channel; outline of author's original mathematical theory of phenomenon which agrees with experimental results.

HYDROLOGY, METEOROLOGY, AND SEISMOGRAPHY

GROUND WATER. Problems in Design of Structures for Controlling Ground Water, D. Farr and W. Gardner. *Agric. Eng.*, vol. 14, no. 12, Dec. 1933, pp. 349–352. Darcy's law; horizontal drains; vertical wells; pumping costs; well battery system offers important advantages over small wells; improving efficiency of design by specifying large diameters.

RAIN GAGES. Les récents progrès des méthodes pluviométriques, A. Boutaric. *Nature (Paris)*, no. 2918, Dec. 1, 1933, pp. 489–494. Notes on recent progress in rainfall investigations; types of rain gages.

INLAND WATERWAYS

CANAL LOCKS, GATES. Dock Entrances and Lock Gates, H. H. Bird. *Ry. Engr.*, vol. 55, no. 1, Jan. 1934, pp. 7 and 8. Types of gates; storm protection; outline plan of typical lock entrance; typical plan showing water-tight deck; advantages of iron and steel over wooden gates.

RIVERS, IMPROVEMENT. Training-Works in Connection with Shortening of Empress Bridge over River Sutlej, W. Macrae. *Inst. Civ. Engrs.—Min. Proc.*, vol. 237, no. 4911, 1933, pp. 14–25, 1 supp. plate. History of training works at the Empress Bridge over River Sutlej and details of design and construction of new training works.

IRRIGATION

WATER LOGGING. Investigation of Rise of Water Table in Upper Chenab Canal Area, Punjab, E. M. Taylor, J. K. Malhotra, and M. L. Mehta. *Punjab Irrigation Research Inst.—Research Pub.*, vol. 1, no. 4, April 1933, 39 pp., 5 supp. sheets. Investigations of water logging in the Punjab based on statistical examination of well records, rainfall, and canal discharges; regression curves; effect of rain upon water table; comparison of rainfall and irrigation water; control of water logging in upper Chenab Canal area. Bibliography.

LAND RECLAMATION AND DRAINAGE

ANDAMAN ISLANDS. Andamans Dredging Scheme, D. G. Harris. *Civ. Eng. (London)*, vol. 28, no. 330, Dec. 1933, pp. 455–458, and vol. 29, no. 331, Jan. 1934, pp. 22 and 23. Scheme for land reclamation and malaria control estimated to cost 165,000 pounds sterling; use of dredge drawing from 7 to 8 ft of water, equipped with two 30-in. centrifugal pumps and a working crew of 100; difficulties in progress of dredging; performance of dredges.

ASSESSMENT. Drainage Rating, R. W. Jolly. *Chartered Surveyors' Inst.—Journal*, vol. 13, no. 9, March 1934, pp. 475–486. Evolution of British system of assessing acreage benefited by land drainage, with special reference to new Land Drainage Act of 1930.

NETHERLANDS. L'endiguement du Zuyderzée, M. de Blocq van Kuffeler. *Societés des Ingénieurs Civils de France—Mémoires et C R des Travaux—Bul.*, vol. 86, nos. 7–8, July-Aug. 1933, pp. 819–861, 2 supp. plates. Detailed illustrated report on reclamation of the Zuiderzee in Holland, similar in contents to several other articles, indexed in Engineering Index, 1931, 1932, and 1933.

PORTS AND MARITIME STRUCTURES

HAVRE, FRANCE. Autonomous Port of Havre. *Naut. Gaz.*, vol. 124, no. 4, Feb. 17, 1934, pp. 6–9. Development instigated by French Chamber of Commerce; port has 11 docks covering an area of 218 acres, 125-acre tidal basin, and three maritime passenger railway stations. Similar descriptions indexed in Engineering Index, 1933, from various sources.

PIERS, CONSTRUCTION. Pier Construction in 28-Ft. Tide. *Eng. News-Rec.*, vol. 112, no. 7, Feb. 15, 1934, pp. 219–224. Construction of steel core cofferdam for new pier, 700 ft long and 300 ft wide, consisting of a gravel fill retained between heavy gravity walls carried on concrete arches; long steel-core cofferdam inclosing 43 acres was wrecked twice by high tides; removal of cofferdam; features of pier walls of new design; excavation and filling.

PORTLAND, MAINE. New Tidewater Facilities of Portland Terminal Company at Portland, Maine, A. H. Morrill. *Boston Soc. Civ. Engrs.—Journal*, vol. 20, no. 10, Dec. 1933, pp. 235–249, (discussion) 249–254. Description of new terminal, passenger, freight, and wharf facilities and service for Boston and Maine and Maine Central railroads; office building; total cost $2,000,000.

ROADS AND STREETS

AUSTRALIA. Australian Roads. *Surveyor*, vol. 85, no. 2196, Feb. 23, 1934, pp. 257–259. Review of 20-year progress in development of Victoria State highway system; survey of special problems and research.

CANADA. Ontario Good Roads Convention. *Can. Engr. (Ontario Road Convention Number)*, Feb. 27, 1934, pp. 43–70. Proceedings of annual meeting, 1934, including abstracts of the following papers: Highways in Northern Ontario, W. Finlayson; Highways of Ontario, R. M. Smith; County Road—Its Place in Our Highway Development, T. R. Patterson; Have Large Expenditures Changed Public Attitude Toward Highway Development? T. J. Mahony; Highway Situation in Ontario, L. Macaulay; Function of Township Roads, M. R. Parrish; Function of Township Roads, C. M. Collins; Country Roads, C. A. Robbins; Report of Secretary, S. L. Squire; Highway Development in Ontario, G. S. Henry; Highway Expenditures in Ontario, L. Macaulay; Unemployment Situation, A. Meighen.

CONCRETE. Heavy-Duty Concrete Road to Norris Dam. *Eng. News-Rec.*, vol. 112, no. 8, Feb. 22, 1934, pp. 254 and 255. Construction of concrete highway, 4.8 miles long, for heavy hauling between railroad and dam site; road is contracted to be finished in 69 working days.

CONSTRUCTION. Building Memorial Highway. *Contractors and Engrs. Monthly*, vol. 28, no. 1, Jan. 1934, pp. 17–23. Construction of penetration macadam pavement, 8 miles long, at Whiteface Mountain, Lake Placid, N.Y.; drilling and blasting; drainage structures; quantities and unit prices; gasoline service and lubrication.

GERMANY. German State Motor Roads, H. Seidel. *Eng. Progress*, vol. 15, no. 1, Jan. 1934, pp. 1–4. Significance to traffic and national economy; present condition of German roads; organization of road construction; construction features of state motor roads; methods of construction.

HIGHWAY LIGHTING, SODIUM VAPOR. Sodium-Vapor Lights for Highway Illumination. *Eng. News-Rec.*, vol. 112, no. 8, Feb. 22, 1934, pp. 257 and 258. Installations on several hazardous stretches of road in New York and New England, indicating superior effectiveness of the new type of lamp and reflector.

INTERSECTIONS. Drainage and Surface Form at Road Intersections, H. C. Platts. *Surveyor*, vol. 85, no. 2193, Feb. 2, 1934, pp. 177–179. Determination of center line and channel profiles; adjustment of channel profiles; procedure for design; contours for normal camber; utility of contoured plans.

MACADAM. Research to Rationalize Use of Cement-Macadam Construction, *Eng. News-Rec.*, vol. 112, no. 7, Feb. 15, 1934, pp. 230–234. Field and laboratory research by the Portland Cement Assn., Chicago, Ill., develops important fundamental principles governing the construction of cement-penetration roads; grout studies; study of aggregates; study of grout flow; subgrade treatments; methods of compaction; strength tests.

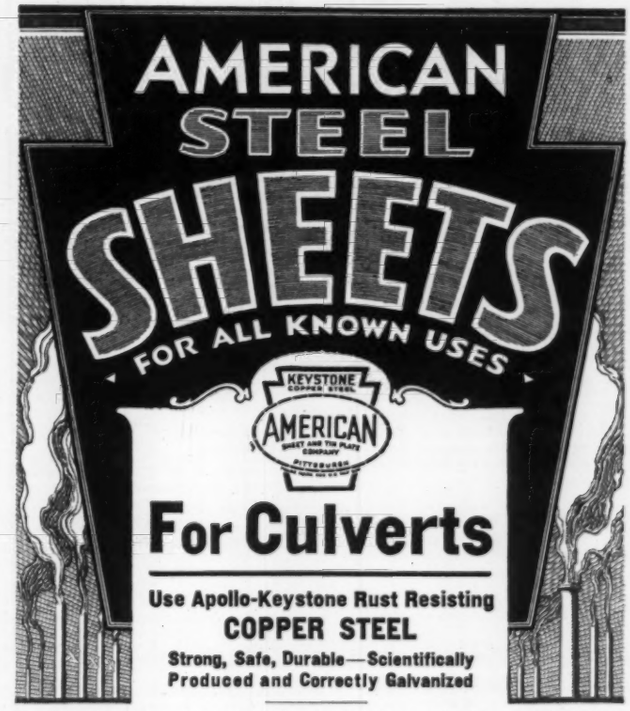
RAILROAD CROSSINGS, SIGNALS AND SIGNALING. Crossing Gate with Light Signals Installed at Railroad Crossing. *Ry. Signaling*, vol. 27, no. 1, Jan. 1934, pp. 28 and 29. Interlocking at crossing of single-track lines of Alton and Pennsylvania replaced by simple arrangement adequate for present traffic; features of gate and signal.

RELOCATION. Realignment of Old National Road, C. C. Brooking. *Eng. News-Rec.*, vol. 112, no. 10, March 8, 1934, pp. 311–313. More than 1 mile of road near St. Clairsville, Ohio, laid out in 1826, relocated to reduce curvature; high-level concrete-arch bridge carries new road over river and railway.

ROADSIDE IMPROVEMENT. Roadside Improvement Projects Actively Sponsored by United States Bureau of Public Roads. *Am. City*, vol. 49, no. 1, Jan. 1934, pp. 39–44. Outline of new program of U. S. Bureau of Public Roads; future development of roadside landscaping.

SEWERAGE AND SEWAGE DISPOSAL

ACTIVATED SLUDGE. Activated-Sludge Plant Proposed for Washington. *Eng. News-Rec.*, vol. 112, no. 10, March 8, 1934, pp. 328–330. Features of new sewage treatment plant for the District of Columbia; recommendations on the use of secondary treatment during summer, with



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STORM SEWERS, CORRUGATED IRON
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plain sedimentation only during colder months; gas utilization and sludge washing before dewatering; flow diagram for complete treatment during warmer months.

GREAT BRITAIN. New Main Outfall Sewer and Reconstruction Sewage Treatment Works at Duckpits and Wood End, Burnley, P. Hargreaves, and A. Race. *Inst. Mun. and County Engrs.—Journal*, vol. 60, no. 16, Jan. 30, 1934, pp. 1168–1185. Design and construction of sewage disposal works, including a 54-in. cast iron outfall, 1,600 yd long, designed for a population of 110,000, to deal with dry-weather flow of 2,750,000 gal per 24 hr.

JAPAN. Sewage Treatment in Japan, I. W. Mendelsohn. *Mun. Sanitation*, vol. 4, no. 12, Dec. 1933, pp. 406–408. Outline of Japanese program for sewage disposal improvements, following British and American practices; general data on sewage treatment plants at Tokyo, Osaka, Nagoya, and Kyoto; comparative data of activated sludge plants in Great Britain, Japan, and United States; experimental plant for Kyoto; government financial assistance.

SEWERS, STOPPAGE. Well Water Causes Sewer Stoppages, M. Maffitt. *Eng. News-Rec.*, vol. 112, no. 7, Feb. 15, 1934, p. 226. Sewer in Wilmington, N.C., stopped on account of the presence of carbon dioxide and calcium in the water, forming deposits of calcium carbonate.

SLUDGE. Logical Design of Separate Sludge Digestion Plant and Its Effect Upon Other Phases of Sewage Treatment, A. S. Lowe. *Surveyor*, vol. 84, no. 2183, Nov. 24, 1933, p. 478. Optimum conditions for sludge digestion; heating of sludge; objections to open tank; vertical circulation of sludge; capacity of tanks; costs of digestion tanks required for various populations. Before Inst. Sewage Purification at Public Works, Roads, and Transport Congress.

STREAM POLLUTION. Summary of Current Literature. *Dept. Sci. and Indus. Research—Water Pollution Research*, vol. 7, no. 2, Feb. 1934, pp. 37–72. Abstracts of 135 items from international technical press dealing with water treatment, sewage disposal, and pollution of streams.

TORONTO. Proposed Sewage Disposal Plant for City of Toronto, *Can. Engr.*, vol. 66, nos. 5 and 10, Jan. 30, 1934, pp. 7–11, and March 6, pp. 7–11. Jan. 30: Abstract of consulting engineers' report covering pumping station, outfall tunnel, and disposal plant at Highland Creek; total cost estimated at $25,000,000. March 6: Sewage treatment plant; outlet conduit from treatment plant; estimated cost of constructing plant and outlet conduit.

STRUCTURAL ENGINEERING

ARCHES, STRESSES. Action d'une force horizontale sur un arc symétrique à double articulation, E. Massotte. *Technique des Travaux*, vol. 9, no. 11, Nov. 1933, pp. 701–703. Theoretical mathematical analysis of the action of horizontal force on a two-hinge symmetrical arch.

BEAMS, STEEL. Ueber die Erhoehung der Fliessgrenze in prismatischen Balken aus Baustahl, E. Ohwalla. *Stahlbau* (*Supp. to Bautechnik*), vol. 6, nos. 19 and 20, Sept. 15, 1933, pp. 149–151; and Sept. 29, pp. 153–155. Theoretical mathematical discussion of methods of raising yield point of prismatic structural steel beams; review of recent literature on subject.

POSTS, CONCRETE. Design of Concrete Fence Posts. *Concrete Bldg. and Concrete Products*, vol. 9, no. 2, Feb. 1934, pp. 25–26, 28, and 30. Dimensions and reinforcement required for various lengths; permissible spans between posts; effect of wind pressure; resistance to bending; practical cases.

STRUTS, DESIGN. Naeherungsloesungen fuer besondere Faelle von Knickbelastung, K. Pohl. *Stahlbau* (*Supp. to Bautechnik*), vol. 6, no. 18, Sept. 1, 1933, pp. 137–143. Approximate solutions for several particular cases of design of struts and columns subjected to buckling stresses; numerical examples.

TUNNELS

CONSTRUCTION, GEOPHYSICS. Le Tunnel de Gibraltar, P. Devaux. *Nature* (*Paris*), no. 2922, Feb. 1, 1934, pp. 119–125. Recent geophysical investigations made on the Straits of Gibraltar railroad tunnel; history; seismological operations carried out by P. Jevenois and J. G. Sineriz; underground and underwater construction.

RAILROAD. Driving and Concreting Railroad Tunnel in Shale and Limestone. *Contractors and Engrs. Monthly*, vol. 28, no. 2, Feb. 1934, pp. 27–29. Construction of single-track railroad tunnel, 1,050 ft long, for the Pittsburgh Coal Company at Grimms Bridge, near East Liverpool, Ohio, in an almost inaccessible location.

VEHICULAR, NEW YORK. Second Vehicle Tunnel to Be Built at New York. *Eng. News-Rec.*, vol. 112, no. 10, March 8, 1934, pp. 313–315. Features of proposed Midtown Hudson Tunnel at the west end of 39th Street, New York City, to carry traffic across the Hudson River; the tunnel is to consist of two circular tubes, with outside diameter of 31 ft.

WATER SUPPLY TUNNELS, INSPECTION. Special Inspection Car Built for Use in Hetch Hetchy Tunnel. *Eng. News-Rec.*, vol. 112, no. 13, March 29, 1934, p. 406. Electric truck for inspection of Coast Range Tunnel, 28.5 miles long, equipped with storage batteries for a 72-mile trip.

WATER PIPE LINES

MAINTENANCE AND REPAIR. Critical Survey of Problems of Reconditioning of Water Mains and Its Proved Economic Solution, A. Goffey. *Water and Water Eng.*, vol. 36, no. 428, Jan. 20, 1934, pp. 26–28. Reasons for relining; methods of relining.

STORAGE. Pipe Yard Facilities in Chicago, W. Weigel. *Am. Water Works Assn.—Journal*, vol. 25, no. 12, Dec. 1933, pp. 1716–1719. Plan and equipment of five main storage yards of the Water Pipe Extension Division of the Chicago Water Works.

WATER PUMPING PLANTS

BOOSTING. Boosting Water Supply for High-Level Districts. *Can. Engr.*, vol. 66, no. 7, Feb. 13, 1934, pp. 10–12. Features of hydrostat pumping equipment boosting directly into closed-main distribution system and adjusting its supply according to draw-off from services.

WATER TREATMENT

ACTIVATED CARBON. Evaluation of Activated Carbons for Water Treatment. *Eng. and Contract Rec.*, vol. 48, no. 10, March 7, 1934, pp. 185 and 186. Physical and chemical tests for determining effectiveness as purifying agent; three methods of evaluation of carbons have been advanced: phenol adsorption, dilute iodine, and threshold odor tests.

ALGAE CONTROL. Algal Growths and Water Supply, J. W. Husband, *Surveyor*, vol. 84, no. 2186, Dec. 15, 1933, pp. 555 and 556 (discussion) 563–565. Paper before Inst. Water Engrs. Winter Meeting, 1933, previously indexed from Water and Water Eng. (Special Inst. No.), no. 427, Winter 1933.

AMMONIA-CHLORINE. Chloramine Process. *Engineer*, vol. 157, no. 4075, Feb. 16, 1934, pp. 178–180. Advantages and application of process; photographs and general layout of apparatus installed by Paterson Engineer Company at Hampton works, in England.

ANALYSIS. Simple Water Analysis, H. G. Smith. *Can. Min. Journal*, vol. 55, no. 1, Jan. 1934, pp. 14–17. Description of simple routine water tests which can be carried out by engineers possessing only a limited knowledge of chemistry, but which are sufficient to ensure correct softening of water for all purposes; importance of use of pure water for boiler feed and concentrating mill feedwater.

BACTERIOLOGY. Bacterial Efficiency of Certain Intermediate Stages of Water Treatment, H. W. Streeter. *Pub. Works*, vol. 64, no. 12, Dec. 1933, pp. 17–20. Results of observations on the operation of experimental plant with Ohio River water; series of field observations of efficiency of municipal water purification systems, embracing 10 plants located on the Ohio River and 14 plants located along the Great Lakes; relation between 37 C bacterial counts in filtered and chlorinated water; studies of water purification efficiency.

CHLORINATION. Cheltenham: Water Supply and Its Chlorination. *Water and Water Eng.*, vol. 36, no. 428, Jan. 20, 1934, pp. 11–13. Abstracts of papers read at a meeting of the Royal Sanitary Institute, on Oct. 27, 1933: Water Supply of Cheltenham, J. S. Pickering; Chlorination of Water, with Special Reference to Cheltenham Supply, D. E. Morley.

COAGULATION. Removal of Copper Sulfate from Water by Alum Coagulation, C. J. Brockman. *Eng. News-Rec.*, vol. 112, no. 10, March 8, 1934, pp. 326 and 327. Report from University of Georgia tests, indicating that large concentrations of copper sulfate can be removed by alum coagulation, within normal pH range.

CONTAMINATION. Corrosion of Zinc in Various Waters, E. A. Anderson, C. E. Reinhard, and W. D. Hammel. *Am. Water Works Assn.—Journal*, vol. 26, no. 1, Jan. 1934, pp. 49–60. Report on tests by the Research Division of the New Jersey Zinc Company on the corrosive effect of chlorinated drinking water on zinc; toxic effects from zinc in water. Bibliography.

FILTRATION, MATERIALS. Magnesiummetall fuer Wasseraufbereitung, H. Bach. *Gesundheits-Ingenieur*, vol. 56, no. 46, Nov. 18, 1933, pp. 545–547. Use of magnesium metal as filtering material, filter acting as reagent; use of magnesium in water dechlorination, water neutralization and treatment of boiler feedwater.

SOUTH AFRICA. Rand Water Board. *Water and Water Eng.*, vol. 35, no. 426, Dec. 20, 1933, pp. 711–715. Water softening and purification of Rand Water Board Supply, serving an area of 1,862 sq mi, with a population of 726,000; bacteriology and biology of Vaal River water; projects of extension and additional water supply, including dam on Vaal River.

WATER WORKS ENGINEERING

DISTRIBUTION SYSTEMS, PRESSURE RECORDERS. Value of Continuous Pressure Recorders in Chicago, J. B. Eddy. *Am. Water Works Assn.—Journal*, vol. 25, no. 12, Dec. 1933, pp. 1645–1648. Experience of Chicago confirms the belief that a system of permanent pressure recorders is indispensable to the operation of an extensive distribution system.

DROUGHT EFFECT. Drought of 1933 and Water Supply. *Water and Water Eng.*, vol. 36, no. 428, Jan. 20, 1934, pp. 14–24. Review of conditions in British water works, with special reference to emergency measures taken.

HISTORY. Rohrberechnung und Stroemungsmessung in der altroemischen Wasserversorgung, F. Kretzschmer. *VDI Zeit*, vol. 78, no. 1, Jan. 6, 1934, pp. 19–22. Methods of ancient Roman water-works engineers with reference to the design of pipe lines and measurement of the flow of water, based on Sextus Julius Frontinus' "De aquae ductibus urbs Romae."

LAWS AND LEGISLATION. City Liable for Typhoid Fever Contracted through Public Water Supply. *Am. Water Works Assn.—Journal*, vol. 26, no. 1, Jan. 1934, pp. 128–134. Review of recent cases in Montana and other western states.

MANAGEMENT. Delinquent Water Bills in Depression, M. F. Hoffman. *Am. Water Works Assn.—Journal*, vol. 25, no. 12, Dec. 1933, pp. 1636–1639. Responsibility for payment of bill; period of water consumption covered by bill; flexibility of procedure to permit cooperation with consumer.

METERING. Great Loss to Water Department from Faulty Meter Reading. *Eng. News-Rec.*, vol. 112, no. 13, March 29, 1934, p. 408. Experience of the Bureau of Water of Cicero, Ill., which in 1933 had to charge off its books $164,900, representing the value of the water that had been used by consumers in excess of the amount for which they had been billed.

OBSOLESCENCE. What Cost Obsolescence? L. H. Enslow. *Am. Water Works Assn.—Journal*, vol. 26, no. 1, Jan. 1934, pp. 61–68 (discussion) 69. Cost of obsolescence in industrial plants and water works; obsolescence in practice; chemical feed equipment; copper services; accounting methods; flocculation; pumping; what smaller municipalities can accomplish.

PROGRESS REPORT. Water Supply and Sanitary Engineering in 1933. *Engineer*, vol. 157, nos. 4069 and 4070, Jan. 5, 1934, pp. 25 and 26, supp. plate and Jan. 12, pp. 54–56. Notes on activities in various parts of Great Britain, with brief reference to recent improvements in France and Hong Kong.

RAILROADS, WATER SUPPLY. Gravel Wall Wells Reduce Cost, C. R. Knowles. *Ry. Eng. and Maintenance*, vol. 30, no. 2, Feb. 1934, pp. 69 and 70. System installed at Grenada, Miss., consisting of two wells 184 ft deep, operated by electrically driven turbine pumps, replacing steam-plant pumping from river, which reduces cost of providing, and materially improves the quality of water furnished locomotives through development of water supply from deep wells.

RATE MAKING. State Regulation of Water Rates for Municipal Water Plants, A. B. McCrum. *American Water Works Assn.—Journal*, vol. 25, no. 12, Dec. 1933, pp. 1690–1697. General discussion of theory of regulation of water rates of municipal water works by states in the light of recent American experience, particularly in West Virginia and Wisconsin; state regulation helpful to management.

SPRINKLERS, CONTROL. Inspection and Control of Sprinkler System and Other Special Connections, J. A. Jensen. *Am. Water Works Assn.—Journal*, vol. 25, no. 12, Dec. 1933, pp. 1649–1652. Sprinkler system as private service; control of water in sprinkler systems.

TANKS. Ornamental Enclosure for Steel Water Tank. *Am. City*, vol. 49, no. 2, Feb. 1934, pp. 63 and 64. Construction of brick enclosure to conceal 4,000,000-gal tank in Baltimore.

TOWERS, RECTIFICATION. Righting and Stabilising of 200,000-Gallon Water Tower, R. V. Allin. *Concrete and Constr. Eng.*, vol. 29, no. 1, Jan. 1934, pp. 3–13. Method of rectification of new reinforced-concrete water towers which, on account of the unequal settlement of the foundation, tilted 28 in. from plumb.

UNITED STATES. Meeting of Virginia Water and Sewage Works Association. *Water Works and Sewerage*, vol. 81, no. 1, Jan. 1934, pp. 15 and 16. Abstracts of the following papers: Correcting Troubles Experienced with Open Service Reservoir, R. L. Warren; Coagulation Difficulties Solved by Use of Well Water to Adjust pH value, B. S. Parrish; Pumping Problems and Power Requirements, A. J. Saville; Water Measurements, P. H. McGauhey.

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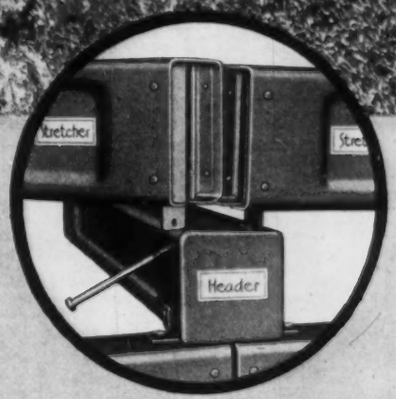

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BRIDGES

CAISSONS, CONCRETE. Bay Bridge Foundations Built with Unique Domed Caissons, C. H. Purcell, C. E. Andrew, and G. B. Woodruff. *Eng. News-Rec.*, vol. 112, no. 14, Apr. 5, 1934, pp. 431–436. Sinking of reinforced concrete caissons for West Channel piers of San Francisco–Oakland Bay Bridge, to maximum depth of 220 ft; improvement in open-dredging process by maintaining domes over well tops to permit control by compressed air during sinking; domes raised by adding sections to wells as sinking advances; design of caissons; patent situation.

CONCRETE FRAME. Canadian National Constructs Another Unusual Concrete Bridge. *Ry. Age*, vol. 96, no. 12, Mar. 24, 1934, pp. 430–433. Two-track fixed-frame structure with span 72 ft 6¼ in. long, which has shallow slab and carries tracks without ties or ballast, constructed near Vaudreuil, Quebec.

DESIGN. Statics of Bridge Design, G. Dunn. *Concrete and Constr Eng.*, vol. 29, nos. 1 and 2, Jan. 1934, pp. 15–35, and Feb., pp. 153–163. Methods of calculation of bridge members for simple slab, girder, and arch spans; formulas for preliminary designs; slab bridges; example of slab design for purely concentrated loads on single spans; simple slab without ribs and continuous over one support; simple slabs without ribs and continuous over four spans; rectangular slabs supported along four sides. (To be continued.)

PIERS, CONSTRUCTION. Substructure and Approaches of Lake St. Louis Bridge, J. A. Lalonde. *Eng. Journal*, vol. 17, no. 3, Mar. 1934, pp. 118–128. Construction of caissons and concrete piers in fast current, 30 ft deep, for Lake St. Louis Bridge; 4,500 ft long; maximum span 400 ft; also construction of 1,440 ft of concrete viaduct approaches.

SAN FRANCISCO–OAKLAND BAY. San Francisco–Oakland Bay Bridge, C. H. Purcell, C. E. Andrew, and G. B. Woodruff. *Eng. News-Rec.*, vol. 112, no. 12, Mar. 22, 1934, pp. 371–377. Historic background of greatest current bridge-building project; selection and advantages of final site; financial setup and traffic estimate; design considerations; loads and stresses; trans-bay traffic between San Francisco and Oakland; materials and basic unit stresses.

STEEL, GERMANY. Die Elbebruecke bei Tangermuende. *VDI Zeit.*, vol. 78, no. 7, Feb. 17, 1934, pp. 214–216. Design and construction of highway bridge over the Elbe River at Tangermuende, Germany, having a total length of 834 m, including a steel arch span, 115 m long, and 23 continuous girder spans up to 58.2 m in length.

STEEL TRUSS, INDIA. Indus Bridge at Kalabagh, North Western Railway, India—I and II, W. D. McD. Cruickshank and W. T. Everall. *Ry. Engr.*, vol. 55, nos. 3 and 4, Mar. 1934, pp. 73–80, and Apr., pp. 124–129. Designed to connect broad gage (5 ft 6 in.) system of North Western Railway with its narrow gage (2 ft 6 in.); nine 263-ft modified Petit-type truss spans formed originally designed structure; shorter 164-ft subdivided Pratt truss spans were added as a result of experience gained during 1929 floods. Mar.: Wells, caissons and piers; working season 1928–31; serious damage by high floods in 1929. Apr.: Girder erection.

SURVEYING. Triangulation Surveys for San Francisco–Oakland Bay Bridge, D. R. Warren. *Western Construction News and Highways Builder*, vol. 9, no. 2, Feb. 1934, pp. 48–50. Description of triangulation networks having four base lines.

BUILDINGS

EARTHQUAKE EFFECTS. Ultimate Strength of Building Structures Against Earthquake, N. Mononobe. *Tokyo Imperial Univ.—Earthquake Research Inst.—Bul.*, vol. 12, pt. 1, Mar. 1934, pp. 35–43. Theoretical mathematical analysis to determine how much buildings, which are designed to resist seismic factor 0.1, can resist after several resonance oscillations; numerical examples. (In English.)

HEAT INSULATION. Methodik und hygienische Bedeutung der Waermeschutzmessung mit besonderer Berueecksichtigung der Oberflaechentemperaturen des Raums, A. Seiser and E. Frueholz. *Gesundheits-Ingenieur*, vol. 56, nos. 40 and 41, Oct. 7, 1933, pp. 469–472, and Oct. 14, pp. 483–486. Determination of heat insulation of buildings, with special reference to surface temperatures; objective definition of climatic comfort; radiation of heat from buildings; measurement of surface temperatures in building of University of Munich; heat insulation of windows. Bibliography.

REFRIGERATION. Rockefeller Center Air Conditions Sunken Plaza Shops, A. Merle. *Heating and Vent.*, vol. 31, no. 3, Mar. 1934, pp. 19–21. Shops in heart of Rockefeller Center in New York City cooled by centrifugal refrigeration machines located in sub-basement of adjoining R. C. A. Building; machines have combined capacity of 600 tons per 24 hr; distribution; filters; humidification.

TERMITES. Termites and Methods of Combating Them, H. von Schrenk. *Wood Preserving News*, vol. 12, no. 3, Mar. 1934, pp. 38–43. Importance of taking proper precautions in use of wood for structural and ornamental purposes; details of forms and characteristics, of subterranean type of white ants; use of prevention methods in design of buildings. Before joint meeting of Houston Engrs.' Club, Am. Inst. Architects, Rice Inst. Eng. Soc., and Am. Wood-Preservers' Assn.

WIND STRESSES. Influence of Neighboring Structures on Wind Pressure on Tall Buildings, C. L. Harris. *U. S. Bur. Standards—Journal Research*, vol. 12, no. 1, Jan. 1934, pp. 103–118, 1 supp. plate; see also *Eng. News-Rec.*, vol. 112, no. 10, Mar. 8, 1934, p. 327. Measurements of wind pressure over model of Empire State Building as affected by presence of neighboring models simulating buildings, which might be erected on adjacent blocks; object was to determine shielding effect for different directions of wind; analysis of results.

CITY AND REGIONAL PLANNING

GREAT BRITAIN. New Model Clauses under Town and Country Planning Act, F. L. Thompson. *Surveyor*, vol. 85, no. 2200, Mar. 23, 1934, p. 352. Streets and building lines; building restrictions; temporary and permanent prohibition or restriction of building. Before Town Planning Inst. Great Britain.

LONDON. Planning of London, Past and Present, W. R. Davidge. *Roy. Inst. Brit. Architects—Journal*, vol. 41, third series, no. 9, Mar. 10, 1934, pp. 429–453; (discussion) 454–458. History of planning of city of London since period of Roman conquest; ancient maps and views.

TENNESSEE. Industry and Agriculture in Tennessee Valley, W. R. Woolrich and J. P. Ferris. *Mech. Eng.*, vol. 56, no. 4, Apr. 1934, pp. 195–202. Phases of undertaking under Government auspices; experiment in regional planning and in cooperation with private industry.

CONCRETE

AGGREGATES. Aggregate Producers Make and Sell Concrete for San Francisco Bridges, E. Shaw. *Rock Products*, vol. 37, no. 3, Mar. 1934, pp. 28–32. Merchandising aggregates carried out on large scale; some things aggregate producers must know about concrete; specifications drawn to fit aggregates from various sources; concrete requirements; emergencies to be met; placing concrete; necessity for uniform consistency; materials for concrete; cement; aggregate specifications; batching plant.

MIXING. Proportioning Concrete Mixes for Definite Cement Content, J. E. Buchanan. *Western Construction News and Highways Builder* vol. 9, no. 2, Feb. 1934, pp. 42–43. Construction of alignment chart; numerical problem illustrating its use.

REFRACTORY MATERIALS. Refractory Concrete, R. T. Giles. *Metals and Alloys*, vol. 5, no. 2, Feb. 1934, pp. 28–30. Unsuccessful attempts to use portland cement; introduction of high alumina cement; function of lumnite in refractory concrete; development of pre-fired and fired strength; nature of aggregate to be used; grading of aggregate; mixing; placing; curing and drying; use of refractory mortars; insulating concrete; costs.

REINFORCEMENT. Application of High-Grade Steel in Reinforced Concrete, F. von Emperger. *Structural Engr.*, vol. 12 (New Series), no. 3, Mar. 1934, pp. 160–178; (discussion) 178–183. Results of original tests of economy of use of high-yield-point steel in reinforced concrete; safety factor of permissible load as against breaking load; limiting of permissible stresses in order to avoid dangerous cracks; use of Isteg steel reinforcement made of two mild-steel rods twisted together under conditions in which ends are fixed.

ROADS AND STREETS. Concrete Roads, J. H. Walker. *Quarry and Roadmaking*, vol. 39, no. 448, Feb. 1934, pp. 45–49. Special reference to crack control and shrinkage forces; characteristics of concrete in relation to road construction; deficiencies in existing roads; remedies for defects; interlocking and other joints. Before Instn. Engrs. and Shipbldrs. in Scotland.

STREETS. Concrete Paving Successful in Sub-Zero Weather, H. P. Chapman. *Eng. News-Rec.*, vol. 112, no. 16, Apr. 19, 1934, pp. 501–502. Experience of Department of Highways of Ohio with uninterrupted construction of concrete pavements in temperatures ranging from freezing to below zero.

VIBRATING. Concrete Pavement Quality Improved by Vibration. *Construction Methods*, vol. 16, no. 1, Jan. 1934, pp. 26–29. Development of vibration; vibration specifications; principal vibrator types; roller vibrator; pan attachment; portable vibrators; vibratory screed finisher; quantitative test results; observations in New Jersey and Missouri.

CONSTRUCTION INDUSTRY

COSTS. Un Bid Summary. *Western Construction News and Highway Bldr.*, vol. 9, no. 2, Feb. 1934, pp. 64, 66, 68, 70, 72, and 74. Unit costs bid on irrigation and reclamation, bridges and culverts, street and road work in Oregon, Arizona, California, Nevada, and Missouri.

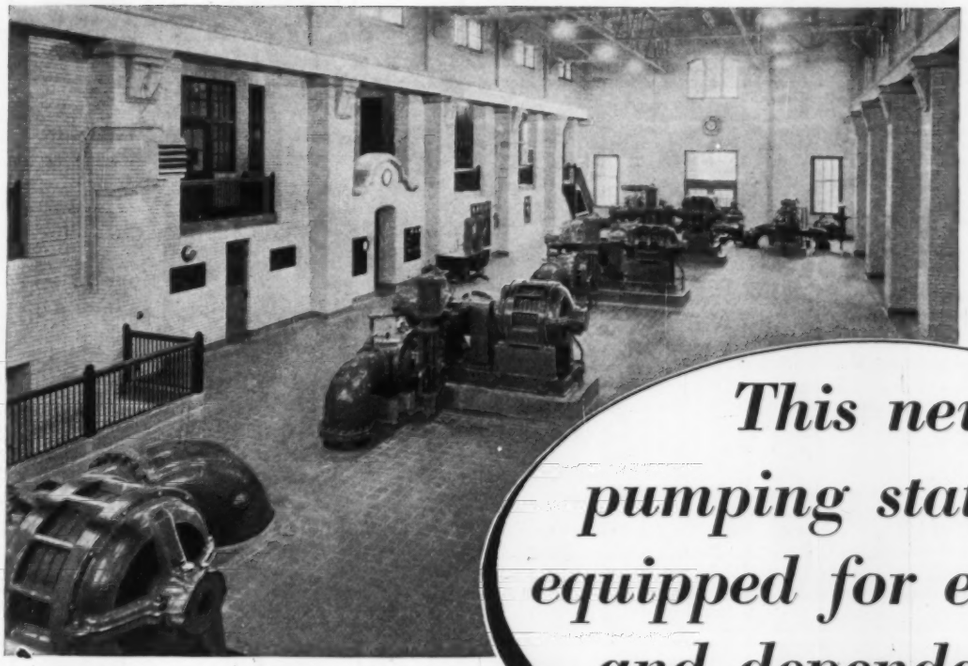
DAMS

BOULDER DAM PROJECT. Fabricating Welded Pipe for Boulder Dam, W. A. Cather. *Am. Welding Soc.—Journal*, vol. 13, no. 3, Mar. 1934, pp. 4–5. Nine photographs with brief explanatory notes, showing application of welded pipe to construction of Boulder Dam.

DESIGN. First International Congress on Large Dams. *Engineering*, vol. 137, nos. 3549, 3550, 3553, and 3555, Jan. 19, 1934, pp. 80–81; Jan. 26, pp. 108–109; Feb. 16, pp. 207–208; and Mar. 2, pp. 78–79. Review of reports and papers presented at Congress held in Stockholm, June 28 to July 1, 1933.

EARTH, DESIGN. Upon Flow of Water Through Earth Dams, F. B. Nelson-Skornyakov. Moscow, Glavvodkhoz, 1933. 86 pp., figs., diagrs., tables, charts. Outline of method of computing seepage through earth dams, including hydraulic-fill dams, based on Darcy's law and assumption of horizontal flow of seepage streams in body of dam; critical review of formulas given by Schoclitsch and H. Hatch. (In Russian, with English abstract, pp. 72–86.)

EARTH, GREAT BRITAIN. Earthen Reservoir Embankments and Outlet Works, P. B. Glendinning. *Surveyor*, vol. 85, no. 2200, Mar. 23, 1934, pp. 353–354. Results of inspection of more



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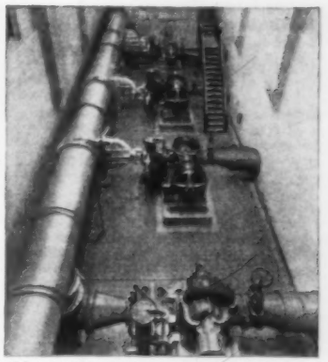

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GENERAL ELECTRIC

than 50 earth dams in Great Britain by authority of Safety Provisions Act; faults in design and construction of embankments and trenches, waste weirs, and overflow channels; draw-off and outlet works. Before Instn. Water Engrs.

MOVABLE. Novel Dam of Movable Cylinders. A. J. Gowan. *Elec. Journal*, vol. 31, no. 2, Feb. 1934, pp. 68–71. Movable dam being built across the Mississippi River at Davenport, Iowa, consists of series of 11 cylinders, or gates, laid lengthwise across river, each one of which can be rolled up to allow free passage of river beneath it; each main gate of Rock Island Dam consists of structural steel cylinder, 109.25 ft long and 19.33 ft in diameter, mounted between concrete piers; novel characteristics cited.

MOVABLE ROLLER. Roller-Gate Dam Erection at Rock Island, Ill. *Eng. News-Rec.*, vol. 112, no. 13, Mar. 29, 1934, pp. 410–413. Design and construction of world's largest roller-gate dam, extending 1,200 ft diagonally across the Mississippi; piers and sills; roller gates; service bridge; pier construction; shop assembly for gate erection; field erection.

UNITED STATES. Three Big Dam Operations Begin in Northwest. *Eng. News-Rec.*, vol. 112, no. 14, Apr. 5, 1934, pp. 441–445. Review of conditions and initial construction operations at Bonneville and Grand Coulee, on the Columbia River, and Fort Peck on the Missouri River.

FLOOD CONTROL

CHINA. Study of Shansi's Rivers, O. J. Todd. *Assn. Chinese and Am. Engrs.—Journal*, vol. 15, no. 1, Jan. 1934, pp. 7–14, 3 supp. sheets. Flood control and other hydraulic problems of the Fen Ho and the Yellow River; the Fen Ho's storage problem; diversion from the Fen Ho; flood protection; pumping plants for irrigation; hydroelectric power from the Yellow River; the Sang Huto Ho in Central Shansi; the Chang Ho in southeastern Shansi; scope of river investigations in Shansi.

DEBRIS. Debris Flow from Canyons in Los Angeles County Flood, C. A. Taylor. *Eng. News-Rec.*, vol. 112, no. 14, Apr. 5, 1934, pp. 439–440. Abstract of report on character of the detritus outflow that caused most of the damage in the flood of January 1934; denuding of Canyon sides by fire provided areas for heavy erosion.

GREAT BRITAIN. Thames Tides and London Floods, E. S. Bellasis. *Engineering*, vol. 137, no. 3558, Mar. 23, 1934, pp. 337–338. Review of investigations; conclusion arrived at in Liverpool Tidal Institute's report is that probability of flood in London is, at present, one in 60 years, and that this will be reduced to between one in 120 years and one in 180 years, if defences near and up to London Bridge are raised by 0.5 ft.

FLOW OF FLUIDS

HYDRAULIC MODELS. Frouden ja Reynolds in vastaavaisuuslakien vaelisen ristiriidan vaelttaeminen mallinkokeissa, E. J. Helle. *Teknillinen Aikakauslehti*, no. 2, Feb. 1934, pp. 62–69. Theoretical mathematical discussion explaining how to avoid disagreement in model experiments between laws of comparison by Froude and Reynolds.

JUMP. Critical Depth of Flow in Open Channels, G. S. Coleman. *Instn. Civ. Engrs.—Selected Eng. Papers*, no. 124, 1932, 19 pp. Report on author's original tests of non-uniform flow and hydraulic jump formation in channels of circular cross section.

FOUNDATIONS

BRIDGE PIERS. Survey Work for Lake St. Louis Bridge, C. F. Draper. *Eng. Journal*, vol. 17, no. 3, Mar. 1934, pp. 113–117. Preliminary soundings, borings, and current measurements for 4,500-ft highway bridge approaching completion, over St. Lawrence River near Lachine, Que.; leveling, triangulation, and direct check measurements for location of center lines of 14 piers; use of steel supports for checking suspended-tape measurements.

BRIDGES. Bridge Foundations—II, H. E. Brooke-Bradley. *Structural Engr.*, vol. 12 (New Series), no. 3, Mar. 1934, pp. 130–140. Survey of attendant problems in design; piers; functions of piers; location; choked waterways; damage by flood; protection from scour; failure of Waterloo Bridge; protection of piers in soft soils; pier dimensions; hollow or divided piers; tension stress in piers; arch bridges with elastic piers; span economics; movable bridges; foundation pressures.

CAISSONS, CONCRETE. Rotinoff Caissons. *Engineer*, vol. 157, no. 4077, Mar. 2, 1934, pp. 224. Methods of driving precast concrete hollow cylindrical piles developed and successfully applied by West's Rotinoff Piling and Construction Company; method consists in driving, with familiar type of hammer, concrete shell up to 24 in. in diameter, lower end of which is closed by steel shoe, to which force of blow is transmitted by steel mandrel passing up interior of shell.

EARTH PRESSURE. Large Retaining Wall Tests. V—Pressure of Glacial Till, K. Terzaghi. *Eng. News-Rec.*, vol. 112, no. 16, Apr. 19, 1934, pp. 503–508. Results of final tests on actual soil from Fifteen-Mile Falls Dam indicate close conformity to principles deduced in preparatory studies of sand and fine-grained soils; results of test of till in drained state showing that high value of internal friction was developed by wall movement; effect of wall movement on modified-till backfill.

RETAINING WALLS. Crib Retaining Walls Versus Solid Masonry, C. P. Disney. *Ry. Eng. and Maintenance*, vol. 30, no. 4, Apr. 1934, p. 204. Relative advantages and disadvantages of two types of construction in light of practical considerations.

SAN FRANCISCO–OAKLAND BAY BRIDGE. Foundation Operations on San Francisco–Oakland Bridge. *Contractors and Engrs. Monthly*, vol. 28, no. 4, Apr. 1934, pp. 24–26. Cofferdam construction in shallow water; work on deeper cofferdam; high-pressure pumping.

TESTING. Neue Ergebnisse der dynamischen Baugrunduntersuchung, H. Lorenz. *VDI Zeit.*, vol. 78, no. 12, Mar. 24, 1934, pp. 379–385. Report from German Society for Soil Mechanics, at Berlin Institute of Technology, on new apparatus and recent research on dynamic testing of soils and foundations—particularly vibration in foundation sites.

TESTS. Determining Bearing Power in Earth Foundations, H. J. Summers. *Eng. News-Rec.*, vol. 112, no. 16, Apr. 19, 1934, pp. 499–501. Tests, theory, and interpretation of bearing tests conducted for foundations of elevated water tank at Torrance, Calif.; time-settlement and load-settlement curves.

HYDRAULIC ENGINEERING

HYDRAULIC LABORATORIES, UNITED STATES. Organization and Operation of Waterways Experiment Station, H. D. Vogel. *Military Engr.*, vol. 26, no. 146, Mar.–Apr. 1934, pp. 121–122. Brief history and description of United States Waterways Experiment Station of Vicksburg, Miss.; review of research projects and outdoor models.

LAKES, REGULATION. Lake-Level Control by Submerged Sills, W. F. Heavey. *Eng. News-Rec.*, vol. 112, no. 14, Apr. 5, 1934, pp. 437–438. Report on model studies confirming general plan and giving design data for submerged sills in St. Clair River, to check flow and raise levels of lakes Michigan and Huron; monthly mean levels of lakes Michigan and Huron for period, 1919 to 1933; backwater effects; economics and cost.

HYDRO-ELECTRIC POWER PLANTS

GREAT BRITAIN. Galloway Water Power Scheme. *Concrete and Constr. Eng.*, vol. 29, nos. 2 and 3, Feb. 1934, pp. 144–152, and Mar. pp. 223–227. Design and construction of hydro-electric power plant development in Scotland; total capacity of some 66,000 kw, operating at heads of from 70 to 177 ft; project includes two concrete-gravity dams less than 100 ft high, pressure aqueduct $\frac{3}{4}$ mi long, and concrete-lined tunnel $1\frac{1}{4}$ mi long.

HYDROLOGY, METEOROLOGY, AND SEISMOGRAPHY

EARTHQUAKE EFFECT. Experience of California Installations Indicates Effect of Quake on Water Works, C. P. Harnish. *Water Works Eng.*, vol. 87, no. 1, Jan. 10, 1934, pp. 12–13. Report of chief engineer of American States Water Service Company, operating in 30 communities in southern California; none of pumping plants damaged; damage to Los Alamitos tank; serious break in large pipe line; leaks in service connections; lessons of earthquake. Before Am. Water Works Assn.

EARTHQUAKES. Selection of Seismology, American Geophysical Union and Eastern Section of Seismological Society of America, Proceedings of joint meeting, April 27–29, 1933. *Nat. Research Council (Am. Geophys. Union—Trans.)* June 1933, pp. 251–336.

HYDROLOGY. Section of Hydrology. *Nat. Research Council (Am. Geophys. Union—Trans.)* June 1933, pp. 337–521. Reports and papers, including: Hydrology of Snow, J. E. Church; Glaciers, F. E. Matthes; Evaporation, G. F. McEwen; Absorption and Transpiration, C. H. Lee; Run-off, L. K. Sherman; Physics of Soil Moisture, F. J. Veihmeyer; Underground Water, D. G. Thompson; Organizations Studying Ground-Water Hydrology; Investigations of Underground-Water Problems in California, New Mexico, and Oregon, A. M. Piper; Papers Relating to Ground-Water Hydrology, A. N. Sahre; Dynamics of Streams, L. B. Straub; Hydraulics Laboratories with Facilities for Research in Open-Channel Flow and River Hydraulics; List of Organizations Whose Work Is Related to That of Committee on Dynamics of Streams; Investigators in Dynamics of Streams; Chemistry of Natural Water, C. S. Scofield; Variation and Control of Salinity in Sacramento-San Joaquin Delta, 1931, T. H. Means; Use of Stream-Flow Records in Connection with Problems in Hydrology, C. H. Pierce; Precipitation and Run-off and Altitude Relations for Connecticut River, H. K. Barrows; Flow-Duration Characteristics of North Carolina Streams, T. Saville and J. D. Watson; Upper Congo River Drainage Basin, W. F. Uhl; Variation of Run-off on Pacific Slope, F. F. Henshaw; Storm-Flow Prediction, H. R. Leach, H. L. Cook, and R. E. Horton; Rôle of Infiltration in Hydrologic Cycle, R. E. Horton; Revised Temperature Formulas for Predicting Seasonal Precipitation and Run-off in California, A. F. Gorton; Evaporation as Affecting Run-off of Owens River, Calif., C. A. Copeland; Limitations of Dalton Factor in Evaporation, R. E. Kennedy; Ten-Year Record of Water-Table Fluctuations near Runyon, N.J., H. C. Barksdale; Fluctuations of Water Surface in Observation Wells and at Stream Gaging Stations in Mokelumne Area, Calif., During Earthquake of 1932, A. M. Piper; Specific Yield Determined from Thiem's Pumping-Test, L. K. Wenzel; Deep-Well Salinity Exploration, A. G. Fiedler; Relation Between Moisture Equivalent and Specific Retention of Water-Bearing Materials, A. M. Piper; Theory of Turbulent Flow and Its Relation to Sediment-Transportation, M. P. O'Brien; Bed-Sediment Transportation in Open Channels, C. H. MacDougall; Design of Inland Waterways Treated by Means of Hydraulic Models, M. E. Nelson; Equilibrium Conditions in Debris-Laden Streams, W. W. Rubey; Diversion of Sediment at Branching Channels, G. H. Matthes; Movable Bed Models, H. D. Vogel; Investigation of Wave Action on Sea Walls by Use of Models, K. C. Reynolds; Wave Motion in Channel, J. B. Drisko; Run-off Investigations from Small Agricultural Areas, S. H. McCrory.

LAND RECLAMATION AND DRAINAGE

DRAINAGE. Preventing Ditch Erosion by Check Dams, S. B. Slack. *Eng. News-Rec.*, vol. 112, no. 15, Apr. 12, 1934, pp. 469–470. Design of roadside-ditch grades and cross sections and of check dams to reduce velocity of current in loose-soil ditches, in light of experience of highway department of Georgia; installation of ditch checks; flat-bottom ditches are better for checking erosion than V-bottom ditches.

ITALY. Die Trockenlegung der Pontinischen Suempfe ein Freidenswerk Mussolinis, G. de Thierry. *VDI Zeit.*, vol. 79, no. 6, Feb. 10, 1934, pp. 183–186. Historical and engineering information on reclamation of Pontine marshes along the west coast of Italy, described in several previously indexed articles.

RAILROAD TRACKS. Adequate Drainage Proves Boon to Economical Track Maintenance. *Ry. Eng. and Maintenance*, vol. 30, no. 2, Feb. 1934, pp. 72–75. Measures to eliminate water in roadbed have resulted in drier and better roadbed in years of reduced maintenance expenditures.

MATERIALS TESTING

IRON AND STEEL. Deterioration of Structures in Sea Water, J. N. Friend. *Engineer*, vol. 157, no. 4080, Mar. 23, 1934, p. 302; see also *Engineering*, vol. 137, no. 3558, Mar. 23, p. 352. Last of iron and steel test bars that were exposed for 10 yr have been returned from their respective exposure stations and examined; results observed; brief summary of results of exposure of timber and concrete. From 14th Interim Report of Committee of Instn. Civ. Engrs.; price 1s. 6d.

PORT STRUCTURES, DISINTEGRATION. Deterioration of Structures in Sea Water. *Surveyor*, vol. 85, no. 2199, Mar. 16, 1934, p. 328. Brief review of 14th interim report of special committee of Institution of Civil Engineers; observations of timber test pieces and reinforced concrete test piles.

PORTS AND MARITIME STRUCTURES

NEW ORLEANS. Port of New Orleans, J. W. Porter. *Mar. Progress*, vol. 2, no. 3, Mar. 1934, pp. 24–27 and 52. Port is 13 mi long and 750 ft wide; advantages of geographical location; administrative body; facilities for shipping; public cotton warehouse; special facilities for coffee and bananas; improvements in recent years; plans for future.

PIERS, FIRE PREVENTION. Protecting Piers and Wharves from Fire Hazards. *Mar. Rev.*, vol. 64, no. 3, Mar. 1934, p. 10. Inaccessible and unprotected undersides of many wharves and piers contain combustible material; construction of piers; subdivision of large areas; automatic fire protection; special fire-fighting apparatus. From Factory Mutual Rec., Sept. 1933.

PORT STRUCTURES, AFRICA. New Port Works at Mombasa, F. C. Eforde. *Instn. Civ. Engrs.—Min. Proc.*, vol. 23, no. 4912, 1934, pp. 3–24, 1 supp. sheet. Design and construction of new ocean quay and its equipment; oil jetty and lighterage wharf; traffic; costs.

PORT STRUCTURES, BULKHEADS. Analysis of Sheet-Pile Bulkheads, P. Baumann. *Am. Soc. Civ. Engrs.—Proc.*, vol. 60, no. 3, Mar. 1934, pp. 289–322. Full-sized tests on steel bulkhead, particularly in regard to effective, passive resistance of sand and interlock efficiency of deep-arch sheet piling; suggestions as to possible stress distribution in passive prism between wall and surface of rupture; new theory of stability of bulkheads, which takes into consideration elasticity of both wall and soil and which treats problem as statically indeterminate.

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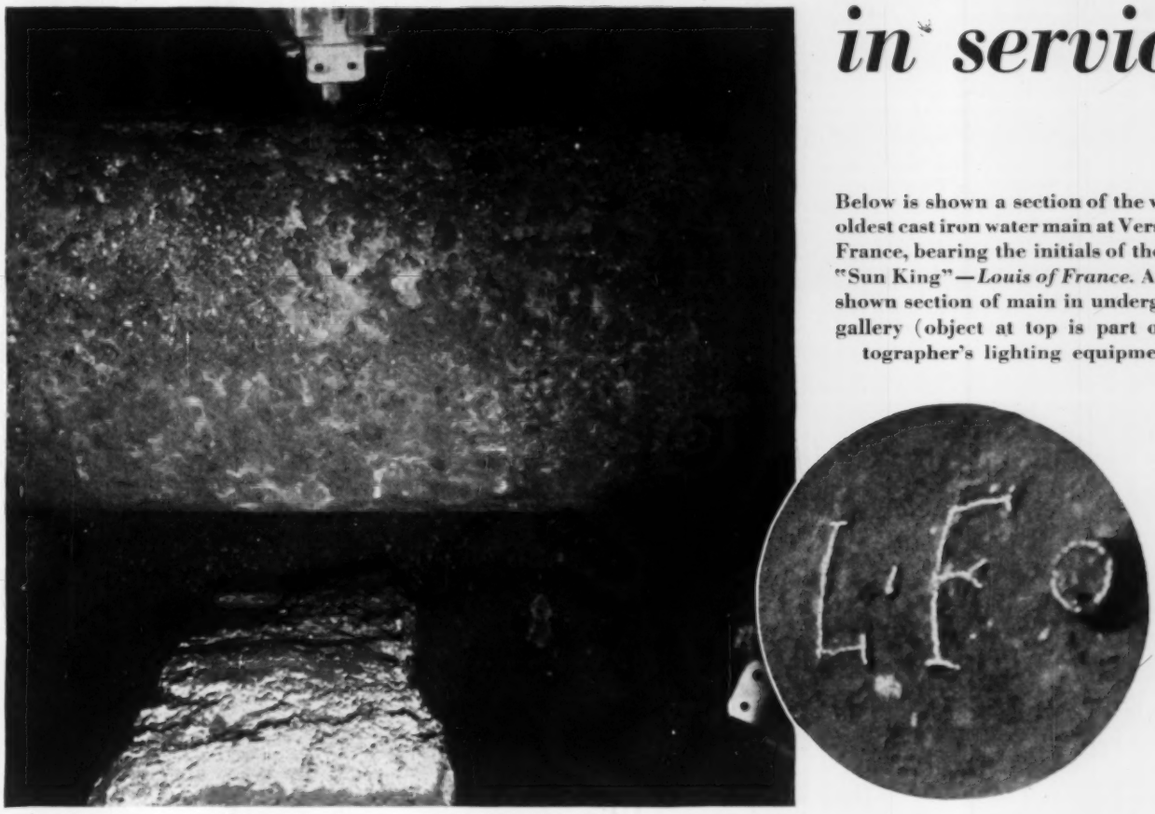

Below is shown a section of the world's oldest cast iron water main at Versailles, France, bearing the initials of the great "Sun King"—*Louis of France.* At left is shown section of main in underground gallery (object at top is part of photographer's lighting equipment).

THE oldest cast iron water mains in the world, by authenticated records, supply the town and the parks of Versailles, France. They were installed in 1664 by order of Louis XIV and are still functioning after 270 years of continuous service. The first photographs of these oldest existing cast iron mains in service underground were recently made for The Cast Iron Pipe Research Association, one of which is reproduced above without retouching. The insert photograph shows a section of the pipe in which is cast the initials of the "Sun King"—Louis of France.

Cast iron mains still in use after serving 100 to 200 years, and longer, have been recently uncovered and inspected in England, France, Germany and the United States. Taxpayers have saved and are saving enormous sums in taxes or rates by reason of the long life and low maintenance cost of cast iron underground mains.

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Methods of evaluating bids now in use by engineers rate the life of cast iron pipe at 100 years minimum

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PORT STRUCTURES, WOODEN. Marine Structures on Gulf Coast, J. F. Coleman. *Wood Preserving News*, vol. 12, no. 3, Mar. 1934, pp. 31–33 and 44. Notes on wood preservation of such structures as wharves, trestles, transit sheds, etc. Before Am. Wood Preservers' Assn.

QUAY WALLS, RECONSTRUCTION. Stabilizing of Quay-Wall, W. Muirhead. *Instn. Civ. Engrs.—Selected Eng. Papers*, no. 121, 1931, 14 pp. Methods of stabilizing concrete quay wall, 600 ft long and 39 ft high, which had moved bodily outwards, and had subsided at same time; maximum horizontal displacement was 17 ft 6 in., and greatest subsidence measured vertically was 5 ft 6 in.

RETAINING WALLS. Experiment on Quay-Walls at King George's Dock, Calcutta, W. C. Ash. *Instn. Civ. Engrs.—Selected Eng. Papers*, no. 122, 1932, 16 pp. Report on micrometer observations on distortion suffered as a result of lateral earth pressure, by vertical and horizontal members comprised in steel box; reactions on horizontal joists; tentative design for "flexible" quay wall for future berths at King George's Dock.

SHORE PROTECTION, UNITED STATES. Annual Meeting of American Shore and Beach Preservation Association, Washington, D.C., Wednesday, Dec. 11, 1933. *Shore and Beach*, vol. 2, no. 1, Jan. 1934, pp. 3–39. Nine papers and reports.

ROADS AND STREETS

ASPHALT. Developments in Highway Surfacing Using Asphalt, B. E. Gray. *Roads and Streets*, vol. 77, no. 1, Jan. 1934, pp. 23–27. Status of state highway systems in United States; surface treatment; quantity of asphaltic material and size of aggregate cover; penetration macadam design; hot-mix surfaces.

BITUMINOUS. Experiments with Retread Method, J. Sears. *Eng. and Contract. Rec.*, vol. 48, no. 8, Feb. 21, 1934, pp. 133–134. Department of highways constructed experimental section of retread surface in Ottawa district; foundation building; stone size; bituminous material; double mixing; cost of this type of construction on provincial highway system has varied from $5,500 to $8,000 per mi.

BRICK, PAVING. New Developments in Production and Use of Paving Brick, G. F. Schlesinger. *Roads and Streets*, vol. 77, no. 1, Jan. 1934, pp. 4–6. Old and new methods compared; most recent developments; resurfacing.

FROST DAMAGE. Frost Heave in Highways and Its Prevention, H. Aaron. *Pub. Roads*, vol. 15, no. 1, Mar. 1934, pp. 10–16 and 25; see also *Eng. News-Rec.*, vol. 112, no. 16, Apr. 19, 1934, pp. 509–511. Survey of practice and of results in prevention of frost heaves on various road surfaces with various characters of subsoil profiles; features of subgrade designs undertaken to reduce frost heaves; drain design to prevent frost heaves in drainable soils.

GREAT BRITAIN. Heavy Road Construction in North Wales, F. G. Bailey. *Eng. News-Rec.*, vol. 112, no. 15, Apr. 12, 1934, pp. 479–480. Old Holyhead main road along Welsh headlands being rebuilt with heavy sidehill cuts, tunnels, and masonry viaducts; road will have 27-ft carriageway, 5-ft footpath on north side, and 2-ft sloping verge on south side.

ROAD MATERIALS. Staubfoermige Stoffe als Fueller im Strassenbau, H. W. Gonell. *VDI Zeit.*, vol. 78, no. 12, Mar. 24, 1934, pp. 373–374. Use of powdered glass, quartz, basalt, marble, limestone, chalk, and similar materials as fillers for bituminous pavements.

ROAD SURFACE TREATMENT. Road Surfacing Materials and Plant. *Quarry and Roadmaking*, vol. 39, no. 449, Feb. 17, 1934 (Special Road Surfacing Number), pp. 84–95. Review of materials and equipment of various companies.

ROAD SURFACE TREATMENT, BITUMINOUS. Comparison of Hand vs. Machine Methods on Bitumuls Treated Road, H. Jardine. *Eng. and Contract. Rec.*, vol. 48, no. 8, Feb. 21, 1934, pp. 124–125. Methods used and resulting costs in producing non-skid surface treatment on Highway No. 15 in Ontario, using day labor and no specialized mechanical equipment.

UNITED STATES. State and County Highway Construction in 1933 and 1934. *Roads and Streets*, vol. 77, no. 1, Jan. 1934, pp. 28–34. Reports from highway officials showing probable expenditures.

SEWERAGE AND SEWAGE DISPOSAL

AERATION METHOD. Methods for Aeration of Sewage, H. E. Babbitt. *Water Works and Sewerage*, vol. 81, no. 1, Jan. 1934, pp. 27–30. Development of sewage aeration methods; comparative study of advantages and disadvantages of two aeration processes; sedimentation in aeration tank; control of operation; absorption of oxygen.

CHEMICAL PROCESS. Chemical Precipitation at Freeport, Long Island, L. L. Luther. *Pub. Works*, vol. 65, no. 1, Jan. 1934, pp. 20–22. Results of experiments and of Freeport study; character of sewage; cost of chemical treatment; comparative cost of primary, intermediate, and secondary treatment; chemicals used. Before N. Y. State Sewage Works Assn.

COAGULATION. Study of Coagulation as Applied to Sewage Treatment—Progress Report No. 1, E. F. Eldridge and F. R. Theroux. *Mich. Eng. Experiment Station—Bul.*, no. 55, Jan. 1934, 22 pp. Price 25 cents. Report on coagulation by means of ferric chloride and use of this chemical as adjunct to sewage treatment; ferric-chloride treatment at Grand Rapids; laboratory studies on coagulation; ferric-chloride application with flocculation. Bibliography.

DISPOSAL PLANTS. Neue Frischwasser-Hauskaeranlagen; Baumeister and Koschare. *Gesundheits-Ingenieur*, vol. 56, no. 52, Dec. 30, 1933, pp. 618–622. Design of fresh water domestic sewage disposal unit of cone and twin-well types.

DISPOSAL PLANTS, DESIGN. Design of Sewers and Sewage Disposal Works as Affected by Infiltration Water, G. Ashton. *Instn. Mun. and County Engrs.—Journal*, vol. 60, no. 20, Mar. 27, 1934, pp. 1411–1422; (discussion) 1422–1429. Comparative study of plants designed to deal with infiltration waters and plants designed with infiltration prevention; practical procedure for prevention; example of infiltration on town's sewerage.

DISPOSAL PLANTS, LANCASTER, PA. Unusual Features of Lancaster, Pa., Sewage Treatment Works, J. F. Laboon. *Water Works and Sewerage*, vol. 81, no. 1, Jan. 1934, pp. 7–10. Description of two new activated sludge sewage disposal plants of 12 mgd capacity; features of particular interest include blowers of variable air output, new type sludge pumps, air control valves of special design, and special arrangement of gas holders; costs.

DISPOSAL PLANTS, LIMA, OHIO. Lima Sewage Treatment Plant, W. S. O'Brien. *Sewage Works Journal*, vol. 6, no. 1, Jan. 1934, pp. 42–57. History, design, construction, and operation of activated sludge sewage disposal plant serving population of 43,000.

DISPOSAL PLANTS, NEW JERSEY. Joint Sewerage Works for Twelve Municipalities in New Jersey, A. Potter. *Sewage Works Journal*, vol. 6, no. 1, Jan. 1934, pp. 58–89. History, design, construction, equipment, and operation of joint sewage treatment plant serving East Orange (part), Hillside, Irvington, Maplewood, Millburn, Newark (part), West Orange, Elizabeth (part), Roselle Park, South Orange, Summit, Union (part); plant capacity 172.5 mgd.

ODOR CONTROL. Control of Odors from Grease Skimmings by Chlorination at Erie, Pennsylvania, A. B. Cameron. *Sewage Works Journal*, vol. 6, no. 1, Jan. 1934, pp. 100–102. Odor control at sewage disposal plant of Erie, Pa., by sterilization with chlorine.

REFUSE DISPOSAL. Digestion of Garbage with Sewage Sludge, C. E. Keefer and H. Kratz, Jr. *Sewage Works Journal*, vol. 6, no. 1, Jan. 1934, pp. 14–23. Report on experimental study by Bureau of Sewers of Baltimore, Md.; characteristics of materials at beginning and end of digestion period; gas production from garbage and raw sludge seeded with digested sludge; optimum pH value for garbage digestion; chemical analyses and heat value of gas produced from digesting garbage and sludge. Bibliography.

SEWAGE DISPOSAL, SLUDGE. Carbon Study of Sludge Digestion-Gas from Water, T. E. Larson, C. S. Boruff, and A. M. Buswell. *Sewage Works Journal*, vol. 6, no. 1, Jan. 1934, pp. 24–35. Experimental carbon balance study of sludge digestion, including carbon determinations on all substances added to and withdrawn from digester, accompanied by accurate total and volatile solids determinations and gas data, to settle question as to whether or not digestion of sewage solids leads to production of greater weight of gas than weight of volatile matter lost through fermentation.

STRUCTURAL ENGINEERING

BEAMS, DESIGN. Selecting Bearing Plates for Steel Beams on Masonry, F. W. Seidensticker. *Eng. News-Rec.*, vol. 112, no. 10, Mar. 8, 1934, p. 318. Construction of table of safe pressures per sq in. on masonry for plates of stated width and thickness for various widths of beam flanges.

FLOORS, WOODEN. Die Gebrauchseigenschaften von Holzboeden, F. Kollmann. *Deutsche Bauzeitung*, vol. 67, no. 48, Nov. 29, 1933, pp. 940–942. Properties and durability of wooden floors on basis of recent experience in Europe and in America.

FRAMED STRUCTURES, STRESS ANALYSIS. New Method for Analyzing Stresses Due to Lateral Forces in Building Frames, J. B. Wilbur. *Boston Soc. Civ. Engrs.—Journal*, vol. 21, no. 1, Jan. 1934, pp. 45–56. Outline of approximate method for analysis of stresses due to static lateral forces in building frames that derive their resistance to these forces from continuity of columns and girders.

STATICALLY INDETERMINATE STRUCTURES, DESIGN. Explanation of Hardy Cross Method for Analysis of Continuous Frames, W. W. Bigelow. *Boston Soc. Civ. Engrs.—Journal*, vol. 21, no. 1, Jan. 1934, pp. 36–44. Simple demonstration of principles involved in method of analyzing statically indeterminate structures, with particular emphasis on physical aspects of problem.

SURVEYING

ROADS AND STREETS. Temporary Roads Department—III. New Method of Survey for Roads. *Roy. Engrs. Journal*, vol. 48, Mar. 1934, pp. 26–44, 3 supp. sheets. Outline of new method of road surveying developed in pioneering in bush country in Gold Coast Colony, Africa; running, plotting, and taking topography along preliminary line; plotting location line on plan; running location line on ground; plotting profile; and establishing grade line.

TUNNELS

VEHICULAR. Mersey Road Tunnel. *Engineering*, vol. 137, nos. 3549, 3553, and 3557, Jan. 19, 1934, pp. 55–58 and 68, supp. plates; Feb. 16, pp. 165–167 and 178; and Mar. 16, pp. 311–313, supp. plates. Plan and construction of tunnel connecting Liverpool and Birkenhead; length under river is circular in section, external and internal diameters being 46 ft 3 in. and 44 ft, respectively; largest subaqueous tunnel in world; parts not under river are of roughly semicircular section; ventilation system; lighting; telephone service, etc.

WATER TREATMENT

ALIGNMENT CHARTS. Operation and Construction of Simple Chemical Dosage Chart, E. C. Handorf. *Water Works Eng.*, vol. 87, no. 1, Jan. 10, 1934, p. 25. Alignment chart for calculating amount of chemicals to be added to water used at University of Iowa Water Works.

CHLORINATION. Tastes, Chlorine, and Chloramines in Water Purification—II, C. H. Capen, Jr. *Water Works and Sewerage*, vol. 81, no. 1, Jan. 1934, pp. 31–33. Effect of ammoniation on chlorine consumption; cost of sterilizing agents; general observations.

DRINKING WATER, ZINC CONTENT. Zinc in Drinking Water, A. G. Nolte and W. A. Kramer. *Am. City*, vol. 49, no. 4, Apr. 1934, p. 63–64. Review of recent studies leading to conclusion that zinc, in amounts generally found in drinking water, has no harmful physiological effects, however uninviting it may appear.

FILTRATION PLANTS, DESIGN. Measuring Porosity of Sand, R. Hulbert and D. Feben. *Water Works Eng.*, vol. 87, no. 1, Jan. 10, 1934, pp. 18–19. Author's original procedure for determination of porosity; difficulties and sources of error in method; revised method; complete size-grading obtained.

TASTE AND ODOR REMOVAL. Tastes and Odors in Delaware River, J. W. Burger and S. Thomas. *Am. Water Works Assn.—Journal*, vol. 26, no. 1, Jan. 1934, pp. 120–127. Report from Laboratory of Bacteriology, Lehigh University, Bethlehem, Pa.; distribution of taste; possible causes; corrective measures.

WATER BACTERIOLOGY. Bakteriologische Schnelluntersuchung von Wasserproben, Schmidt-Lange. *Gesundheits-Ingenieur*, vol. 56, no. 41, Oct. 14, 1933, pp. 486–487. Report from Department of Hygiene of University of Munich, Germany, outlining original rapid method of bacteriological analysis of water samples.

WATER SOFTENING. Municipal Water Softening, W. H. Walker. *Am. Water Works Assn.—Journal*, vol. 26, no. 1, Jan. 1934, pp. 77–98. General discussion of methods of water softening and description of water softening zeolite plant of Etobicoke Township, Ontario, which is first of its kind in Canada; relation of well water supplies to soft water; characteristics of well waters in Ontario; well construction; iron removal; operation data; back wash and rinse water; power consumed; attendance; unit operating costs; soap savings. Bibliography.

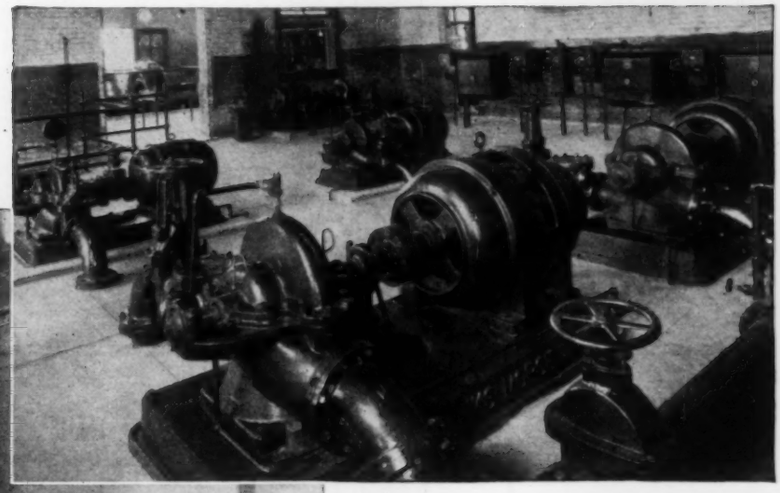
WATER SOFTENING, QUINCY, ILL. Water Softening at Quincy, Illinois, W. R. Gelston, Jr. *Am. Water Works Assn.—Journal*, vol. 26, no. 1, Jan. 1934, pp. 70–76. Reasons for softening; design of softener; small sedimentation basin; paddle mixing basins; clarifier; recarbonator; large sedimentation basin; filter operation; costs; comparison with old iron and lime plant.

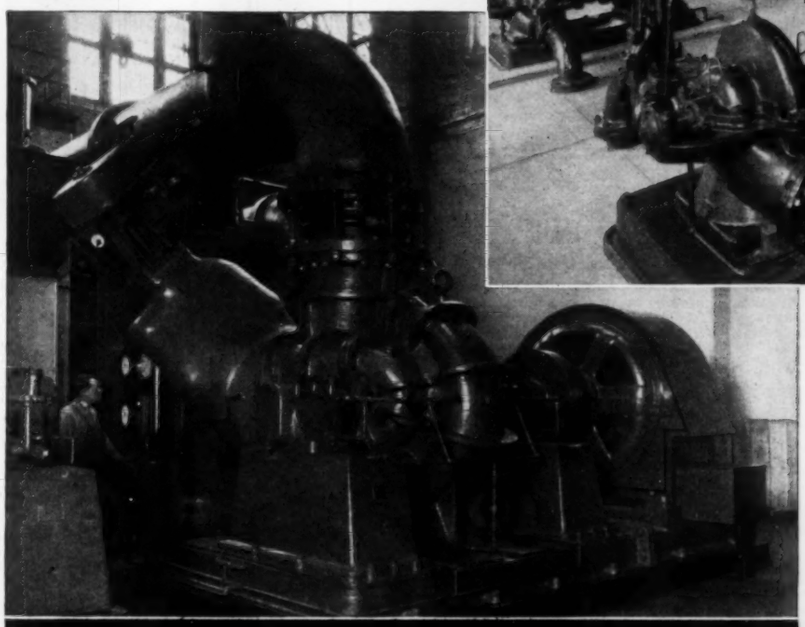
WATER WORKS ENGINEERING

LAWS AND LEGISLATION. Law on Water Rates, L. T. Parker. *Water Works Eng.*, vol. 87, no. 2, Jan. 24, 1934, pp. 70–71. Review of recent court decisions as to unduly preferential and unlawful water rates, domestic rates, cases in which commission's decision is final, and when company can cut off water supply.

METERING. Philadelphia Water Consumption Report Advocates Complete Metering. *Water Works Eng.*, vol. 87, no. 1, Jan. 10, 1934, p. 19. Analysis by staff engineer of Philadelphia Municipal Research Bureau recommending adoption of total meterage.

WELLS DESIGN. Economic Design of Wells and Pumping Plants, M. R. Lewis. *Agric. Eng.*, vol. 14, no. 11, Nov. 1933, pp. 312–315. Drainage wells; factors affecting cost of water; effect of diameter of well, effect of draw-down on cost of water; interference of two or more wells; safe yield of groundwater; planned development. Before West. Irrigation and Drainage Research Assn.





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BRIDGES

ARCHES, DESIGN. Determination of Shape of Arches, H. Carpenter. *Surveyor*, vol. 85, no. 2202, Apr. 6, 1934, pp. 393 and 394. Outline and numerical illustration of method of obtaining ordinates of arch for given loading, originated by Faerber and employed by Koegler and Strassner.

BRIDGE PIERS, CONSTRUCTION. Difficulties in Connection with Pier Construction for Vancouver Bridge. *Eng. and Contract Rec.*, vol. 48, no. 16, Apr. 18, 1934, pp. 325–327. Design and construction of concrete piers for lift span 272 ft long, to carry towers 201 ft above high tide.

CAUSEWAYS, GERMANY. Der Ruegendamm, C. Klammt. *VDI Zeit.*, vol. 78, no. 16, Apr. 21, 1934, pp. 495–501. Survey of traffic between Island of Ruegen and mainland of Germany and outline of project for construction of earth-fill causeway 2.45 km long, including 700 m of bridge work, to span Strela Sound and to connect Stralsund on mainland with Altefaehr on island; causeway to carry one railroad track and a highway 8.5 m wide; cost estimated at 26,000,000 German marks.

CONCRETE. Concrete Bridge Construction on Canadian National Railways. *Can.-Ry. and Mar. World*, no. 434, Apr. 1934, pp. 139–141. Bridge carrying Canadian National Railways double-track main line over Quebec Roads Department, Montreal-Ottawa (via Point Fortune) Highway, near Vaudreuil, Que., is said to be clear width of highway through structure 72 ft 6 1/4 in.; quantities of materials used; bridge designed for Cooper's E-60 loading.

CONCRETE FRAME. Approximate Design Method for Concrete Skew Rigid Frames, E. F. Gifford. *Eng. News-Rec.*, vol. 112, no. 18, May 3, 1934, p. 574. Outline of approximate method, based on Professor Rathbun's theory; simple transformation of forces from plane parallel to abutments of skew bridge to one perpendicular to spandrel walls permits design to be carried out as for square span.

FLOORS. Composite Timber-Concrete Deck Used on Tampa-Clearwater Bridges. *Wood Preserving News*, vol. 12, no. 2, Feb. 1934, pp. 20–23 and 29–30. Description of composite timber-concrete slab used for decking of bridges included in Tampa-Clearwater causeway project in which there is more than 3,500 linear ft of bridging; construction procedure.

FRANCE. Le nouveau pont en béton armé a Castelmoron, sur le Lot. E. E. Marcotte. *Revue Industrielle*, vol. 54, no. 2296, Mar. 1934, pp. 129–134. Features of longest bow-string arch bridge in the world, having span of 143 m, being completed at Castelmoron, France; placement of reinforcement and construction of centering; results of tests.

GOLDEN GATE. Construction Progress on Golden Gate Bridge. *Eng. News-Rec.*, vol. 112, no. 17, Apr. 26, 1934, pp. 541–545. Construction progress report; both anchorages ready for cables; north tower, 702 ft high above pier, nearing completion; future progress depends on foundation work on south pier; going forward under severe difficulties.

VIADUCTS, TRAFFIC SURVEYS. Time Study of Traffic Flow on New Jersey High-Level Viaduct, L. S. Tuttle. *Pub. Roads*, vol. 14, no. 12, Feb. 1934, pp. 223–232. Methods and results of 1932 and 1933 traffic surveys; relation between trip time, volume of traffic, and bridge openings; traffic counts; construction of viaduct advantageous to traffic on other routes.

WELDING. Caisson Welding on World's Largest Bridge, J. H. Dodge. *Welding Engr.*, vol. 19, no. 2, Feb. 1934, pp. 17 and 18. Use of electric arc welding in building caisson for Oakland–San Francisco Bay Bridge; caisson is steel box about 194 ft sq and 50 ft high, containing 55 cylinders, 15 ft in diameter, made of 5/16-in. steel plate.

BUILDINGS

EXHIBITION. Propose Unusual Steel Exposition Buildings, L. Jaudoin. *Steel*, vol. 94, no. 19, May 7, 1934, pp. 28 and 29. Brief description of circular building 1,640 ft in diameter designed by Baudouin and Lotz in the competition sponsored by the Office Technique d'Utilisation de l'Acier of France; frame is conceived as a kind of inverted dome in which compressed assembly is replaced by assembly under tension, equilibrated by belt under compression, and supported by four double consoles similar to springs.

CITY AND REGIONAL PLANNING

LAWS AND LEGISLATION. Town and Country Planning: New Model Clauses, R. Poole. *Surveyor*, vol. 85, no. 2202, Apr. 6, 1934, pp. 397–399. Review of new British regulations as to reservation of lands, streets, and building lines; building restrictions and use of land; general amenity and convenience; maintenance, use, alteration, extension, and replacement of existing buildings. Before Town Planning Inst.

UNITED STATES. Planning of Industrial Areas in the United States of America, W. C. K. Baumgarten. *Int. Housing and Town Planning Bul.*, no. 33, Dec. 1933, pp. 3–17. Industrial districts developed by subsidiaries of railroad companies in the United States; central manufacturing district, Los Angeles; Chicago central manufacturing district; Chicago clearing industrial district; northwestern terminal district, Minneapolis; north Kansas City, Missouri; Fairfax Industrial district, Kansas. (In English, German, and French.)

CONCRETE

ADMIXTURES. Method of Evaluating Admixtures, F. R. McMillan and T. C. Powers. *Am. Concrete Inst.—Journal*, vol. 5, no. 4, Mar.-Apr. 1934, pp. 325–344. Function of admixtures; justification for use of admixtures; basis of design of mixes; factors common to mixes of equal workability; importance of aggregate gradation; evaluating admixture from test results; results obtained with different admixtures.

CEMENT TESTING. Properties of Mortars and Concretes Containing High-Silica Cements, R. E. Davis, R. W. Carlson, J. W. Kelly, and G. E. Troxell. *Am. Concrete Inst.—Journal*, vol. 5, no. 4, Mar.-Apr. 1934, pp. 369–389. Types of high-silica cements; historical notes; interpretation of past experience and research; research program at University of California; discussion of test results; 1934 investigation. Bibliography.

COLD WEATHER. Cold Weather Protection of Concrete, R. B. Young and W. Schnarr. *Am. Concrete Inst.—Journal*, vol. 5, no. 4, Mar.-Apr. 1934, pp. 292–304. Review based largely on experience of Hydro-Electric Power Commission of Ontario; device for testing methods of protection of concrete from cold; efficiency of protective methods; protecting corners and edges; heating enclosures or forms.

CONSTRUCTION, VIBRATING. Vibrating Concrete at Pine Canyon Dam, S. B. Morris. *Am. Concrete Inst.—Journal*, vol. 5, no. 4, Mar.-Apr. 1934, pp. 305–310. Description of equipment and methods specified and used in placing mass concrete; effects of vibrating on properties of concrete.

LIGHT-WEIGHT. Light-Weight Concrete Construction, J. Singleton-Green. *Structural Engr.*, vol. 12, (new series) no. 4, Apr. 1934, pp. 186–196. Characteristics and uses of the following light-weight concrete products: hollow tile floor, ribbed floor, and precast beams; reducing weight of concrete; light-weight aggregates; pumice; coke breeze; clinker; sawdust; burnt clay or shale; haydite; bubblestone; ice concrete. Before Inst. Structural Engrs.

ORNAMENTAL. Architectural Concrete of Exposed Aggregate Type, J. J. Earley. *Am. Concrete Inst.—Journal*, vol. 5, no. 4, Mar.-Apr. 1934, pp. 251–273 (discussion) 274–278. Technique by which architectural concrete of the exposed aggregate type has been developed; concrete ornamentation of Baha'i Temple and similar structures.

PROTECTIVE COATINGS. Fortifying Concrete Against Marine Attacks, R. G. Skerrett. *Compressed Air Mag.*, vol. 39, no. 2, Feb. 1934, pp. 4336–4339. Work of the Los Angeles Harbor department in protecting concrete marine structures by asphalt, which impregnates them against destructive rock-boring type of mollusk.

REINFORCEMENT, TESTING. Deformation of Reinforcement Steel During and After Construction, S. I. Sergev. *Univ. Wash.—Eng. Experiment Station Series—Bul.*, no. 74, Jan. 1934, 30 pp. Experimental comparison of observed unit stresses in longitudinal steel reinforcement, in helically reinforced-concrete columns and T-beams, with calculated theoretical unit stresses and with allowed unit stresses, during and after construction.

DAMS

CONCRETE GRAVITY, STRENGTHENING. Mulholland Dam Backed by Earth-Fill Against Downstream Face. *Eng. News-Rec.*, vol. 112, no. 18, May 3, 1934, pp. 558–560. Placing of heavy earth-fill against downstream face of Mulholland Dam, 210 ft high, near Hollywood, Calif., contrary to the opinion of experts who considered the dam amply safe as it is.

EARTH, KANSAS. Earth-Fill Dam Built by CCC in Kansas. M. A. Wilson. *Pub. Works*, vol. 65, no. 4, Apr. 1934, pp. 33 and 34. Design of earth-fill structure with semi-hydraulic filled core; top width of 40 ft to provide roadway; upstream slope, 3 horizontal to 1 vertical; erosion checked by banquette.

HYDRAULIC GATES. Streamline Diffusing Discharge Regulator. *Engineer*, vol. 157, no. 4082, Apr. 6, 1934, p. 362. Plant built by English Electric Company can control and dissipate, as required, energy of total flow of considerably over 4,000,000 gal per min; example of 5-ft diameter valve working at Mahinerangi Dam in Dunedin, New Zealand.

TENNESSEE. TVA's Second Dam-Building Job, W. M. Hall. *Eng. News-Rec.*, vol. 112, no. 17, Apr. 26, 1934, pp. 525–527. Features of concrete-gravity dam, 70 ft maximum height, and 6,400 ft long, under construction by the Tennessee Valley Authority, on the Tennessee River, including single navigation lock of lift of 50 ft and power house for eight 35,000-hp hydraulic turbines; large crib cofferdam completed; electric shovels floated into cofferdam and unloaded after cofferdam had been unwatered.

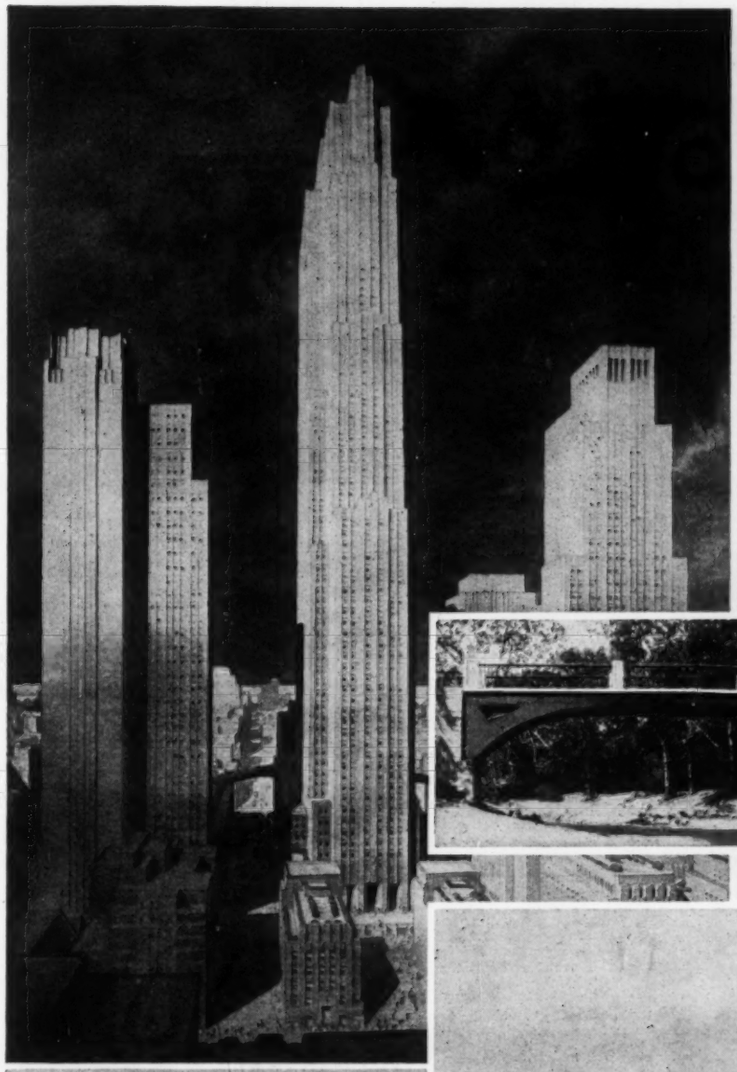
WASHINGTON. Grand Coulee Dam and Power Plant Specifications, A. G. Darwin. *Western Construction News*, vol. 9, no. 4, Apr. 1934, pp. 103–114. U. S. Bureau of Reclamation project, comprising a low-head development of 1,575,000 kw ultimate capacity and irrigation for an area of 1,200,000 acres in central Washington; geology of Grand Coulee dam site on the Columbia River; stream flow and river characteristics; transportation facilities; foundation grouting and drainage; design assumptions for dams.

FLOOD CONTROL

AUSTRALIA. Snowy River Flood of January 1934, M. G. Dempster and W. A. Ozanne. *Commonwealth Engr.*, vol. 21, no. 8, Mar. 1, 1934, pp. 227–234. Description of catastrophic flood estimated to be of a frequency of one in 1,000 years; study of mode of failure of two highway bridges of the steel-truss type.

FLOW OF FLUIDS

FLOW OF WATER, OPEN CHANNELS. Uniform Flow in Alluvial Rivers and Canals, G. Lacey. *Inst. Civ. Engrs.—Min. Proc.*, vol. 23, no. 4893,



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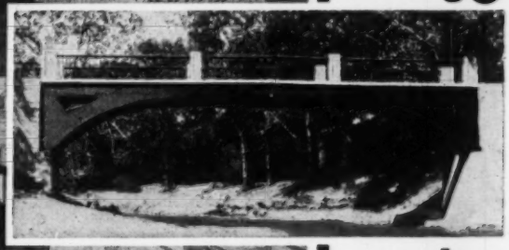
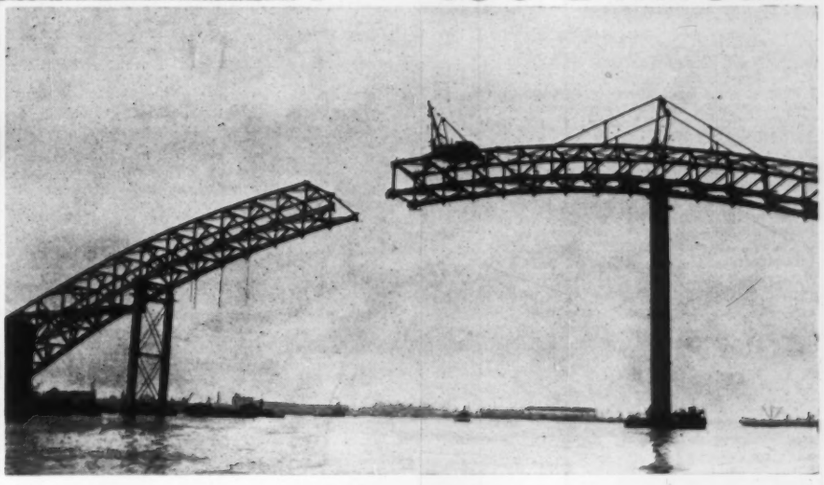


—too Difficult



ABOVE—Rockefeller Center, New York, largest project of its kind in the world. To date, approximately 84,000 tons of structural steel have gone into this project.

CENTER—Small Foot Bridge of pleasing beam-arch design, 8 feet wide and 60 feet long, in Monument Valley Park, Colorado Springs, Colo. About 12 tons of structural steel required.

RIGHT—Bayonne Bridge, over Kill van Kull, New York, longest arch span in the world. Required 26,000 tons of steel, in the fabrication and erection of which unusual and difficult engineering problems were involved.

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1934, 35 pp. Analysis of numerous observations of rivers and canals leading to a general theory of flow applicable to uniform flow in channels in incoherent alluvium; in all channels in incoherent alluvium of the same grading the mean velocity varies as the square root of the hydraulic mean depth; the slope varies inversely as the square root of the hydraulic mean depth, and inversely as the velocity; and the velocity may be expressed by a formula of the Manning type.

FOUNDATIONS

PILES, CONCRETE. Concrete Piles of Type New to this Continent Solve Foundation Troubles in Quebec Building, H. P. Burrell. *Eng. and Contract Rec.*, vol. 48, no. 13, Mar. 28, 1934, pp. 239–242. Use of Franki piles in the construction of the Dominican Sisters' Convent, Berthierville, Que.; overcoming the elasticity of clay; testing of piles.

TESTING. Surface of Earth as Material of Construction, H. H. Leys. *Structural Engr.*, vol. 12 (New Series), no. 4, Apr. 1934, pp. 198–211. Review of recent theoretical and experimental studies on the properties and tests of yielding earth foundations. Before Inst. Structural Engrs.

HYDRAULIC ENGINEERING

ENGINEERING RESEARCH LABORATORIES. Engineering Laboratory Problems Discussed at Iowa Meeting. *Eng. News-Rec.*, vol. 112, no. 17, Apr. 26, 1934, pp. 544 and 545. Abstracts of papers read at a meeting of 150 professors and instructors from ten engineering colleges, held at the University of Iowa; abstracts of papers by C. C. Williams, A. C. Willard, F. M. Dawson, F. T. Mavis, and M. L. Patzig on general engineering and hydraulic laboratories, with special reference to study of silt problems.

RIVERS. Tidal Estuaries—Forecasting by Model Experiments, A. H. Gibson. *Engineer*, vol. 157, no. 4084, Apr. 20, 1934, p. 397. Problems involved in construction and operation of such models, and with comparison of results obtained from Severn model with those observed in estuary. From paper before Roy. Inst.

HYDROLOGY, METEOROLOGY, AND SEISMOGRAPHY

SOILS, EROSION. Making Water Walk in Tennessee Valley, G. Lentz. *Am. Forests*, vol. 40, no. 5, May 1934, pp. 200–202 and 235 and 236. Types of timber check dams constructed by the Tennessee Valley Authority; planting operations to check erosion.

INLAND WATERWAYS

CANAL LOCKS, CONSTRUCTION. Winter Concrete Construction on Rapide Croche Lock. *Eng. News-Rec.*, vol. 112, no. 16, Apr. 19, 1934, pp. 493–495. Replacement of 40-year-old lock at Rapide Croche, on the Lower Fox River near Kaukauna, Wis.; army engineers develop an efficient heating system for cold-weather concrete placing; features of mixing plant and three stiff-leg derricks, all traveling on rails.

IRRIGATION

ALGERIA. Les travaux d'irrigation dans la plaine de l'oued Chelif (Algérie), J. Sers. *Nature (Paris)*, no. 2924, March 1, 1934, pp. 215–220. Irrigation work being carried out on the plain of Chelif, near Orleansville, Algeria; revetment of irrigation canal.

EGYPT. Harnessing the Nile. *Civ. Eng. (London)*, vol. 29, no. 333, March 1934, pp. 93 and 94. Developments in Egyptian irrigation; Quattara and Lake Tana projects; investigations and reports; conditions at Lake Tana; means of regulation.

LAND RECLAMATION AND DRAINAGE

CULVERTS, CONCRETE. Cracked Culvert Interlined with Corrugated Pipe, V. O. Powell. *Eng. News-Rec.*, vol. 112, no. 18, May 3, 1934, pp. 567 and 568. Method of repairing modified horseshoe concrete culvert, 4 ft in diameter, at Helena, Ark.; 36-in. circular corrugated pipe welded outside, pulled into culvert, centered, and grouted in place through pipes from surface; cost data.

MATERIALS TESTING

FLOORS, STEEL. Test of Flat Steel-Plate Floor Under Loads, L. B. Tuckerman, A. H. Stang, and W. R. Osgood. *U. S. Bur. Standards—Journal, Research*, vol. 12, no. 3, Mar. 1934, pp. 363–377, 1 supp. plate. In cooperation with the American Institute of Steel Construction, Inc., flat steel-plate floor was tested under loads to determine its strength and whether the floor behaved as a unit when loads were applied.

PORTS AND MARITIME STRUCTURES

ALGIERS. Port of Algiers, and Mustapha Jetty, M. Benezit. *Civ. Eng. (London)*, vol. 29, no. 332, Feb. 1934, pp. 45–52. Description of harbor and statistical data on traffic of port; construction of vertical breakwater, about 4,000 ft long, up to 25 m in height, consisting largely of concrete blocks up to 450 tons in weight. Before Société des Ingenieurs Civils de France.

SHEDS. Halifax Pier Shed Quickly Rebuilt to Meet Winter Service Demands. *Eng. News-Rec.*, vol. 112, no. 18, May 3, 1934, pp. 570 and 571. Upper floor of reinforced-concrete structure that has been completely wrecked by fire, is cleared of debris, rebuilt, and restored for heavy winter traffic through Port of Halifax.

ROADS AND STREETS

ASPHALT. Emulsified Asphalt Retread Surfaces, R. Harsch. *Western Construction News*, vol. 9, no. 4, Apr. 1934, pp. 123–128. Observations on emulsified asphalt retread paving project contracted by the California Division of Highways, 1933.

ASPHALTIC CONCRETE. Repaving Heavy Traffic Street in Cold Weather Using High Early Strength Cement. *Pub. Works*, vol. 65, no. 3, Mar. 1934, pp. 11 and 12. Brief account of methods used on two streets in Philadelphia.

BITUMINOUS. Use of Bituminous Materials in Highway Construction, K. D. Macdonald. *Can. Engr.*, vol. 66, no. 14, Apr. 3, 1934, pp. 11–13. Factors governing stability or resistance to distortion of soils and aggregates; destructive effect of excess moisture; elimination of surface water; emulsified bitumens.

CONCRETE. Single-Track Cement-Concrete Pavement Construction, H. A. Lumsden. *Can. Engr.*, vol. 66, no. 14, Apr. 3, 1934, pp. 14–16. Advantages of center concrete strip for roads traveled by less than 1,000 vehicles a day; design of slab for single-track pavements; wide intersections desirable. Before 20th Annual Conference on Road Construction, Toronto.

DESIGN. Laying Out of New Streets, J. E. Cardell. *Surveyor*, vol. 85, no. 2197, March 1, 1934, pp. 279–281 (discussion) 281 and 282. Review of recent British legislation; effects of ribbon development; highway widths; contributions of land; compulsory dedication of land. Before Inst. Mun. and County Engrs.

GUARDS. Road Guards Offer Market for Steel in Millions of Tons, A. J. Hain. *Steel*, vol. 94, no. 16, Apr. 16, 1934, pp. 27–29 and 40. Types discussed are wood, wire mesh, cable, and steel plate.

HIGHWAY ENGINEERING, UNITED STATES. Research Activities of Bureau of Public Roads in 1933. *Roads and Streets*, vol. 77, no. 1, Jan. 1934, pp. 17–22. Physical research; production cost studies; transportation and economic and statistical investigations.

LOW COST. Importance of Township Roads in Development of Province, W. S. Cook. *Can. Engr.*, vol. 66, no. 18, May 1, 1934, pp. 19–21 (discussion) 21–22. Duties of road superintendent; operating of road machinery; keeping record of costs; unprotected level crossings. Before Annual Road Construction Conference, Toronto.

MACADAM. Compaction Methods—Their Influence on Cement Bound Macadam as Revealed by Practical Tests. *Eng. and Contract Rec.*, vol. 48, no. 17, Apr. 25, 1934, pp. 349 and 350. Results of tests made by the Portland Cement Association on a test road near Elmhurst, Ill., using rolling, vibration, and hand tamping methods.

MACHINERY, ROLLERS. Three-Point Road Roller Smooths Surface Waves. *Eng. News-Rec.*, vol. 112, no. 18, May 3, 1934, pp. 573 and 574. Bituminous resurfacing operations in Georgia and Texas, demonstrating the usefulness of three-rolls-in-tandem road roller in reducing surface waves.

MAINTENANCE AND REPAIR. Costs of Surface Maintenance of Pavements, W. A. Hardenbergh. *Pub. Works*, vol. 65, no. 1, Jan. 1934, pp. 26–28. Review of American costs and classification of betterments, with special reference to practice in Massachusetts; trunk highway maintenance; analysis of expenditures, Minnesota Highway Department; cost of surface maintenance per sq yd of surface; maintenance costs in Massachusetts; betterments as added value.

MATERIALS, COAL TAR. Developments in Use of Tar for Highways, G. E. Martin. *Roads and Streets*, vol. 77, no. 1, Jan. 1934, pp. 13–15. Surface treatments; re-tread; plant mixes; winter work; suggested grades, coal tar for highway use.

ROAD MACHINERY. Plant-Mix Spreader Builds Smooth Surface Without Forms, V. B. Saville. *Construction Methods*, vol. 16, no. 1, Jan. 1934, pp. 37–41. Description of new machine for spreading and striking off plant-mix bituminous material; mechanical spreader; construction control; condition of surface.

MODERNIZING. Modern Roadmaking, R. G. H. Clements. *Quarry and Roadmaking*, vol. 39, no. 449, Feb. 17, 1934 (Special Road Surfacing Number), pp. 81 and 82. Growth and influence of road research; modernizing of road surfaces on main, secondary, and minor roads; of all the processes that have sprung into popularity and remain as standard methods of construction, the quarry product still forms the real backbone and basis of construction.

RAILROAD CROSSINGS, ELIMINATION. Thirty-Five Main-Line Grade Crossings to Be Eliminated in City of Syracuse in New York Central Project. *Ry. Age*, vol. 96, no. 16, Apr. 21, 1934, pp. 570–574. Elevation of tracks through the city for 4.3 miles will involve approximately 2,000,000 cu yd of embankment and the construction of 25 bridges, and calls for the construction of a new central passenger station.

ROADSIDE IMPROVEMENT. Some Desirable Policies in Program of Roadside Development. W. H. Simonson. *Landscape Architecture*, vol. 24, no. 2, Jan. 1934, pp. 91–99. Comments on recommendations of the Joint Committee of the American Association of State Highway Officials and of the Highway Research Board. Before the Highway Research Board of the National Research Council.

SURFACE TREATMENT, BITUMINOUS. Maintenance Operations and Costs on Ottawa Suburban Roads, A. K. Hay. *Eng. and Contract Rev.*, vol. 48, no. 17, Apr. 25, 1934, pp. 341–343. Cost of bituminous surface treatment on roads; cost per mile of maintaining bituminous road surfaces.

SWAMPS. Metal Arch Culvert Carried by Timber Mat Floating on Muck. *Eng. News-Rec.*, vol. 112, no. 17, Apr. 26, 1934, p. 540. Description of timber mat and corrugated metal arch carrying a roadway over soft muck on a Massachusetts highway.

SEWERAGE AND SEWAGE DISPOSAL

FILTERS, TRICKLING. Die Tropfkoerperanlagen in Deutschland, H. Moehle. *Gesundheits-Ingenieur*, vol. 57, no. 11, Mar. 17, 1934, pp. 140–144; see also translated abstract in *Surveyor*, vol. 85, no. 2201, Mar. 30, 1934, p. 377. Tabulated statistical and engineering data on 59 biological trickling filter plants in Germany, ranging in capacity from 300 to 29,700 cu m; filter media; preliminary treatment of sewage.

FLINT, MICH. Description of Sewage Treatment Plant at Flint, Michigan. *Am. City*, vol. 49, no. 5, May 1934, pp. 46–49. Description of new structures to effect change from plain sedimentation to secondary treatment; pumping station; Imhoff tanks; sludge beds; aeration building; filters; final settling tanks; chlorination; outlet weir and structure; river gage building; plant water supply; administration building and laboratory; efficiency of plant in 1932.

GREAT BRITAIN. Sewage Disposal in Britain, F. Johnstone-Taylor. *Mun. Sanitation*, vol. 5, nos. 1 and 2, Jan. 1934, pp. 8–10 and 23, and Feb., pp. 46–48. Description of Leeds sewage disposal plant; preliminary treatment at Leeds; traveling distributors.

INCINERATORS. Incinerator and Sewage Works Combined for Canajoharie. *Pub. Works*, vol. 65, no. 2, Feb. 1934, pp. 9, 10, and 33. Description of the incinerator to be combined in the new sewage disposal plant of Canajoharie, N.Y., designed for a capacity of 6 tons in 8 hours; equipped with a chimney about 70 ft high.

JAPAN. Sewerage in Nagoya and Kyoto, Japan, I. W. Mendelsohn. *Pub. Works*, vol. 65, no. 2, Feb. 1934, p. 39. Brief description of Horidome and Atsuta plants and plans for plant for Kyoto.

NITRIFICATION. Nitrification in Sewage Mixtures, E. J. Theriault and P. D. McNamee, *Indus. and Eng. Chem.*, vol. 26, no. 5, May 1934, pp. 547–550. Effects of pH adjustment and control on nitrification process; application of results of experiments to sewage treatment.

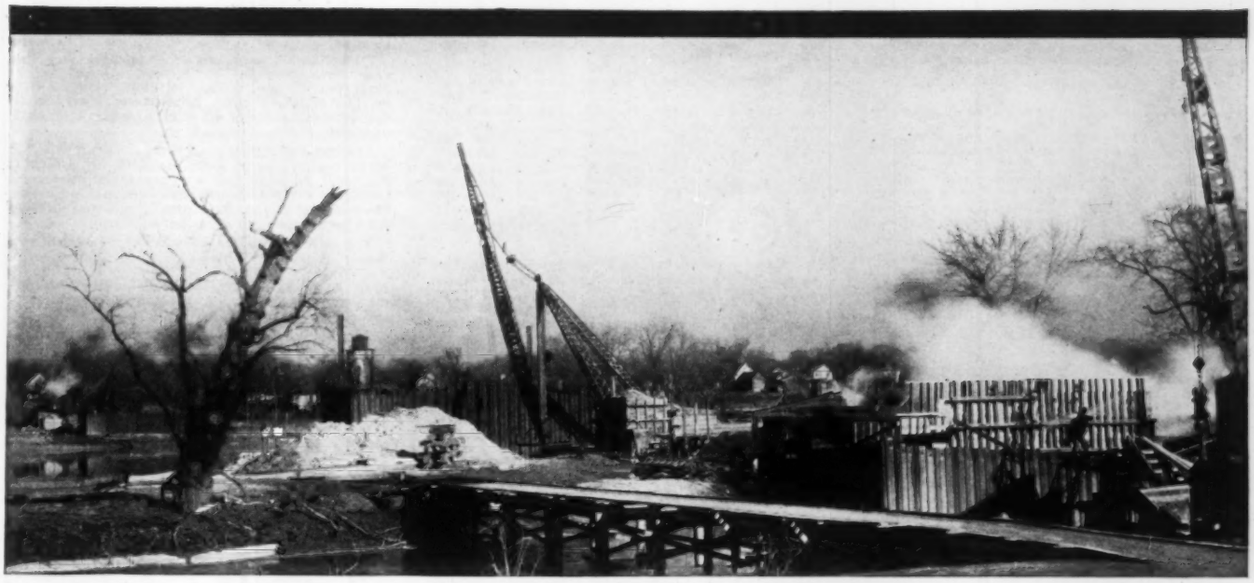
SCHENECTADY, N.Y. Operation of Sewage Treatment Works at Schenectady, N.Y., for Year 1933, M. M. Cohn. *Sewage Works Journal*, vol. 6, no. 2, March 1934, pp. 275–288. Annual review of operation and of proposed reconstruction, extensions, and improvements.

SEWERS, FLOW. New Type Open-Nozzle for Measurement of Sewage Flow, K. R. Kennison. *Boston Soc. Civ. Engrs.—Journal*, vol. 21, no. 1, Jan. 1934, pp. 1–11. Design, construction, and testing of so-called open-nozzle, measuring rate of sewage discharge with little loss of head, and passing dirt and trash with minimum of clogging; 10-in. and 16-in. nozzles of this type for sewers in Ware River watershed of Boston Metropolitan District Water Supply Commission.

SLUDGE. Making Fertilizer from Activated Sludge, H. W. Hincks. *Am. City*, vol. 49, no. 3, Mar. 1934, pp. 45–48. Description of process practiced by tri-city sewage treatment plant serving cities of Pasadena, Alhambra, South Pasadena, and San Marino, Calif.; converting activated sludge into nitroganic fertilizer; analysis of nitroganic fertilizer.

STREAM POLLUTION, BIBLIOGRAPHY. Summary of Current Literature. *Dept. Sci. and Indus. Research—Water Pollution Research*, vol. 7, no. 3, Mar. 1934, 110 pp. Abstracts of 133 items from international technical literature on water works engineering, sewage disposal, pollution of natural waters, etc.

WATER CHLORINATION. Value of Chlorine in Sewage Disposal. *Surveyor*, vol. 85, no. 2203, Apr. 13, 1934, pp. 421 and 422. Some troubles cured and prevented by chlorine treatment;



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STRUCTURAL ENGINEERING

BEAMS, CONTINUOUS. Continuous Beam Design by Successive Influence Lines, I. Dubersteín. *Eng. News-Rec.*, vol. 112, no. 15, Apr. 12, 1934, pp. 471–473. Theorems for solution of continuous beam of any number of supports by simple arithmetical calculations and without the necessity of memorizing or referring to any formulas.

RETAINING WALLS, DESIGN. Crib Retaining Walls. *Pub. Works*, vol. 65, no. 3, Mar. 1934, pp. 18 and 44 and 45. Advantages; forces that must be withstood; formula for pressure on walls; determination of weight of wall; details of construction.

ROOFS, WELDING. Novel Welded Frames Used in Monitor Roof Construction. *Eng. News-Rec.*, vol. 112, no. 18, May 3, 1934, p. 557. Details of special monitor roof construction of the new Ford exhibit building at A Century of Progress Exposition in Chicago.

STATICALLY INDETERMINATE STRUCTURES. Simplified Analysis of Indeterminate Frames, C. A. Ellis. *Eng. News-Rec.*, vol. 112, no. 17, Apr. 26, 1934, pp. 534–539. New procedure based on displacement equations derived from Williot diagrams; practical application of method shown by analysis of four-panel truss and by bridge-tower problem. Bibliography.

TUNNELS

NEW ZEALAND. Excavating Tawa Flat Tunnel. *Excavating Engr.*, vol. 28, no. 4, Apr. 1934, pp. 169–173 and 200 and 201. Construction of two tunnels, 26 by 20 ft, totaling 18,169 ft in length, between Wellington and Tawa Flat, New Zealand; putting in concrete lining; method of timbering; drilling and blasting problems.

RAILROAD, NORWAY. Railway-Tunnel Driving in Norway, B. Holmsen. *Compressed Air Mag.*, vol. 39, no. 1, Jan. 1934, pp. 4310–4315. Plan of operation of Grong or Toemmeras Tunnel; 8,300 ft long, 16.5 ft wide, and 19.5 ft high at center.

VANCOUVER, B.C. Sub-Aqueous Tunnel for Water Supply at Vancouver (B.C.). *Civ. Eng. (London)*, vol. 29, no. 332, Feb. 1934, pp. 54–57. Similar in contents to several articles indexed in Engineering Index 1933 from various sources.

VEHICULAR LIGHTING. L'éclairage du grand tunnel sous l'Escaut à Anvers. *Société Belgedes Ingénieurs et des Industriels—Bul.*, no. 10, 1933, pp. 981–989. Description of electric lamps and wiring diagrams used in the lighting of the Antwerp vehicular tunnel under the Scheldte River in Belgium.

WATER PIPE LINES

CLEANING. New and Ingenious Method for Cleaning and Relining Water Pipes in Place, S. A. McWilliams. *Eng. and Contract. Rec.*, vol. 48, no. 14, Apr. 4, 1934, pp. 274–276. Outline of the Eric method, developed in England, for scraping and relining water mains by electrodeposition of bitumen of the inside surfaces of the pipe from aqueous medium.

WATER TREATMENT

BACTERIOLOGY. Standard Methods and New Procedures for Isolation of Colon Bacilli from Water, C. E. A. Winslow. *Am. Journal Pub. Health*, vol. 24, no. 5, May 1934, pp. 456–461 (discussion) 461–469. Review of literature and reasons why simplified procedure should be adopted; suggested tests for adoption. Bibliography.

DROUGHT EFFECT. Experiences with Treating Dwindling Water Supplies in Northwestern Minnesota, E. L. Lium. *Am. Water Works Assn.—Journal*, vol. 26, no. 2, Feb. 1934, pp. 194–200. Experience in coping with water supply and water treatment difficulties due to unusual continued drought in northwestern Minnesota and North Dakota.

EASTON, PA. New Plant Ends Taste Troubles. *Water Works Eng.*, vol. 87, no. 6, Mar. 21, 1934, pp. 264–266. Main features of new pumping station and filtration plant of the Lehigh Water Company, Easton, Pa., costing $1,000,000; plant operation is controlled by daily laboratory tests.

FILTRATION PLANTS, TORONTO. Filter Plant of Toronto's $14,000,000 Duplicate Water Supply. *Eng. and Contract Rec.*, vol. 48, no. 14, Apr. 4, 1934, pp. 257, 259, and 261. Details of purification unit, comprising 20 filters, now in the process of construction in Victoria Park, Toronto.

FLUORIDE REMOVAL. Removal of Fluorides from Drinking Waters, C. S. Boruff. *Indus. and Eng. Chem.*, vol. 26, no. 1, Jan. 1934, pp. 69–71. Removal of injurious quantities of soluble fluorides from drinking waters can be accomplished by dosing with alum, with subsequent removal of floc by sedimentation and filtration. Bibliography.

METALLIC. Sterilization of Drinking Water by Silver Coated Sand, S. V. Moiseev. *Am. Water Works Assn.—Journal*, vol. 26, no. 2, Feb. 1934, pp. 217–238. Report from the Leningrad Branch of the Union Scientific Research Institute of Water Supply and Sanitary Engineering on experimental work during Oct. 1930–Aug. 1931; disinfecting power of silver coated sand N 56 on unfiltered Neva water; bactericidal stability of silvered sand; method appears ideal for sterilization of drinking water. Bibliography.

ONTARIO. Filter Sand Experiments at Toronto Island Filtration Plant—I, L. F. Allan. *Can. Engr.*, vol. 66, no. 17, Apr. 24, 1934, pp. 5–10 and 17. Apparatus and experiments with small glass filters and results obtained. Before Am. Water Works Assn.

OZONE. Ozone for Treatment of Water, N. J. Howard. *Eng. and Contract Rec.*, vol. 48, no.14, Apr. 4, 1934, pp. 266 and 267. Present status of method of purification that has been experimented with in Europe with promising results; merits of ozone for water treatment; experimental results in London.

RICHMOND, VA. Richmond, Virginia, Filter Plant, M. C. Smith. *Am. Water Works Assn.—Journal*, vol. 26, no. 2, Feb. 1934, pp. 253–259. Description of operating routine; treatment plant; prechlorination; coagulation; filters; chloramines; aeration.

SOFTENING, ZEOLITE PROCESS. Zeolite System of Water Softening. *Eng. and Contract. Rec.*, vol. 48, no. 18, May 2, 1934, pp. 373 and 374. Description of recent municipal installation, Marshall, Mo., that typifies what can be accomplished in water softening at a low cost.

WATER WORKS ENGINEERING

ALBERTA. $4,000,000 Water Supply System for City of Calgary, W. Gore. *Eng. and Contract Rec.*, vol. 48, no. 18, May 2, 1934, pp. 359 and 361–368. Description of dam, reservoir, screen house, and pumping plant. Before Am. Water Works Assn.

CANADA. Water Works Statistics. *Can. Engr. (Water Works Directory and Convention Issue)*, Apr. 10, 1934, pp. 95–126. Supply, pumps, purification, distribution, services, mains, meter rates, names of officials, and other reference data on several hundred water works systems in Canada.

CONSTRUCTION. Water Works Construction with Relief Labor, C. Brossman. *Am. Water, Works Assn.—Journal*, vol. 26, no. 3, Mar. 1934, pp. 309–311. Work on 14 municipal projects under the Public Works Administration Board in Indiana; utilization of relief labor in water works plant or other utilities, such as light plants, and sewer systems.

DISTRIBUTION SYSTEMS, ONTARIO. Unusual Freezing Conditions in Water Distribution Systems, W. E. Macdonald. *Can. Engr.*, vol. 66, no. 10, Apr. 24, 1934, pp. 11–13. Trouble experienced in Ottawa during the past winter and methods adopted in maintaining service in distribution system.

DRINKING WATER, CONTAMINATION. Water Pollution Research, H. Ingleson. *Engineer*, vol. 157, no. 4080, Mar. 23, 1934, p. 299. Summary abstract of report on action of water on lead, with special reference to supply of drinking water; summary of existing knowledge issued by Department of Scientific and Industrial Research—Technical Paper No. 4, published by H. M. Stationery Office, price 2 s.

EMERGENCY SUPPLIES. Meeting Emergencies in Water Works, A. E. Gorman. *Am. Water Works Assn.—Journal*, vol. 26, no. 2, Feb. 1934, pp. 239–246. Checks against faulty design; risk inventory; examples of difficulties.

GERMANY. River Water Used at Dresden to Increase Ground Supply, C. M. Riedel. *Eng. News-Rec.*, vol. 112, no. 18, May 3, 1934, pp. 569 and 570. Main features of new water works of Dresden, Germany, having a population of 620,000; water from Elbe River is settled and filtered and then allowed to seep into the ground; biological process of manganese removal used.

GOVERNMENT REGULATION. State Rating Improves Operator Personnel, J. B. Harrington. *Water Works Eng.*, vol. 87, no. 8, Apr, 18, 1934, pp. 367–369. Regulations of West Virginia requiring the registration of purification plant superintendents and the accomplishments resulting therefrom.

GRAND RAPIDS, MICH. Grand Rapids Water System, C. H. Grinnell. *Am. Water Works Assn.—Journal*, vol. 26, no. 2, Feb. 1934, pp. 247–252. Description of pumping station and other units of water works having a capacity of 15 mgd.

LAWS AND LEGISLATION. Appropriating Private Property, L. T. Parker. *Water Works Eng.*, vol. 87, no. 7, Apr. 4, 1934, pp. 316–318. Review of recent court decisions with respect to the condemnation of private land for municipal water supply uses.

MANAGEMENT. Round Table. *Water Works Eng.*, vol. 87, no. 4, Feb. 21, 1934, pp. 169–171. Practical discussion of training plant operators; financing expenses of specially picked operators for training at short course; regional schools for those interested in water works.

MARSHALLTOWN, IOWA. What Marshalltown Water Works Did This Year, H. V. Pedersen. *Am. Water Works Assn.—Journal*, vol. 26, no. 3, Mar. 1934, pp. 330–333. Coal loading arrangements; new pump installation; extensions of mains and other repairs.

METERING, RECORDS. Records of Meters in Service. *Water Works Eng.*, vol. 87, no. 2, Jan. 24, 1934, pp. 72–74. Practical discussion by water works superintendents and engineers on maintenance of record file of meters in service.

MUNICIPAL ENGINEERING. Large Number of Water-Works and Sewage Projects Contemplated in Ontario and Quebec Municipalities. *Eng. and Contract Rec.*, vol. 48, no. 20, May 16, 1934, pp. 406–411. Proposed Undertakings in Ontario, A. E. Berry; Projects Planned for Quebec Province, R. Cyr.

OPERATION. Modernizing Inefficient Plant, R. H. Ellis. *Water Works Eng.*, vol. 87, no. 4 Feb. 21, 1934, pp. 164–168. Preliminary survey of conditions; shop records; meter repairs; meter records; reading and billing procedure; experiment on corrosion control; dead ends; pumping station; savings through reduction of cost. Before New England Water Works Assn.

PITTSBURGH, PA. Taking the Public Into Confidence on Problems of Water Works. J. H. Kennon. *Water Works Eng.*, vol. 87, no. 8, Apr. 18, 1934, pp. 363 and 382. Investment in filtration plant; removal of acidity of raw water; waste reduction by installation of meters; capacity of pumping plant; maintaining water works balance under population growth.

RATE MAKING. Charges for Domestic Water Supply in Canada. *Am. Water Works Assn.—Journal*, vol. 26, no. 1, Jan. 1934, pp. 28–38 Symposium including following papers: Peterboro, R. L. Dobbin; Windsor, G. C. Storey; Winnipeg, T. H. Hooper; Hamilton, W. L. Mc Faul; Toronto, G. G. Rutledge.

SAN FRANCISCO. Hetch Hetchy Aqueduct. *Engineer*, vol. 157, nos. 4082 and 4083, Apr. 6, 1934, pp. 357–359, and Apr. 13, pp. 374–376. Details of San Francisco's scheme for drawing water from the Sierra Nevadas; water is to flow by gravity from mountains 170 miles distant; work started in July 1914. See also Engineering Index 1932, p. 1423, and previous issues of Engineering Index.

STEEL, WATER TOWERS. Dome Roof on Elevated Steel Water Tank, A. L. Schmidt. *Am. City*, vol. 49, no. 3, Mar. 1934, p. 65. Description of new 500,000-gal steel water tower in Youngstown, Ohio.

ST. LOUIS, MO. St. Louis County Water Company Plant, W. V. Weir. *Am. Water Works Assn.—Journal*, vol. 26, no. 3, March 1934, pp. 392–396. Equipment of system serving 36,000 consumers in an area of 150 sq miles with 660 miles of mains; 4 standtowers and 1 elevated tank.

TANKS, ELEVATED. Defective Elevated-Tank Design Revealed by Earthquake, J. Huber. *Eng. News-Rec.*, vol. 112, no. 16, Apr. 19, 1934, pp. 496–498. Analysis of causes of failure of 150,000-gal elevated tank on 100-ft tower at South Gate, Calif., due principally to faulty tower-rod connections; design did not follow standard specifications in several particulars.

WASTE ELIMINATION. What Is Reasonable Figure for Water Loss in Plant and System? N. W. Knight. *Water Works Eng.*, vol. 87, no. 6, Mar. 21, 1934, p. 263. Percentages of unaccounted-for water; cost negligible as compared with results; determining amount of unaccounted-for water; desirability of night-flow test. Before Am. Water Works Assn.

WELLS, SANITATION. Factors Affecting Sanitary Quality of Deep Well Supplies, F. G. Merckel. *Am. Water Works Assn.—Journal*, vol. 26, no. 3, Mar. 1934, pp. 338–350. Specifications of ideal deep well supply; construction methods; factors to be watched in operation; supervision and control of abandoned wells; drainage wells.

UNITED STATES. Progress in American Water Supply and Purification Practices During 1933, H. E. Jordan. *Water Works and Sewerage*, vol. 81, no. 1, Jan. 1934, pp. 1–6. Review of research; new plants of 1933; improved appearances of modern plants; reawakening of interest in iron salts as coagulants; progress with taste and odor control measures; improved, economical handling of chlorine; laboratory improvements need more attention.

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BRIDGES

CONCRETE GIRDER. Weitgespannte Eisenbeton-Balkenbruecken. K. Hajnal-Konyi. *Beton u Eisen*, vol. 32, nos. 23 and 24, Dec. 5, 1933, pp. 357–360, and Dec. 20, pp. 373–383. Review of theory and practice in the design and construction of long-span concrete-girder bridges; tabulated data on 60 such bridges located in Europe, America, and Asia, including bridges with spans up to 68 m in length.

CONSTRUCTION, SOVIET UNION. Bridge-Building Practices in U.S.S.R., C. L. Christensen. *Eng. News-Rec.*, vol. 112, no. 21, May 24, 1934, pp. 657–659. Review of bridge construction progress in the U.S.S.R., pointing out the adoption of modern American practice; features of main highway and railroad bridges recently completed in the U.S.S.R.

DOMINICAN REPUBLIC. San Rafael 450-Ft Suspension Bridge Has Improved Structural Details. *Construction Methods*, vol. 16, no. 4, Apr. 1934, pp. 28–31. Outstanding features of design of 450-ft span highway bridge with two 9-ft lanes are as follows: interlocking steel channel floor; open-type arrangement of parallel prestressed wire-rope strands; and tower saddles built into structural steel towers instead of on top.

FLOORS. Making Old Bridge Lighter, R. G. Skerrett. *Compressed Air Mag.*, vol. 39, no. 4, Apr. 1934, pp. 4401–4405. Replacing the steel floor of the Smithfield Street Bridge, Pittsburgh, Pa., with aluminum alloy slabs, resulting in a reduction of 751 tons in the weight of the structure and enabling greater live loads.

HIGHWAY. Pioneer Colonial Road Bridges, S. McConnel. *Civ. Eng. (London)*, vol. 29, no. 334, Apr. 1934, pp. 127–130. Design details for permanent bridges in remote localities, to carry one line of traffic only, where suitable timber for structural purposes is not available.

HIGHWAY, INVENTORY. Ohio Keeps Running Inventory of All Highway Bridges. *Eng. News-Rec.*, vol. 112, no. 20, May 17, 1934, pp. 627–629. Complete and accurate data on nearly 7,000 structures of more than 10-ft span and of 57,000 culverts are instantly available from visible index records.

PIERS, CONSTRUCTION. Pier Sinking Through Sand Islands at New Orleans. *Eng. News-Rec.*, vol. 112, no. 19, May 10, 1934, pp. 589–594. Use of artificial sand islands to facilitate the construction of four piers of the New Orleans Bridge, which will have footings 170 ft below low-water level and will support steel truss spans up to 790 ft in length; caissons for larger piers are 65 by 102 ft in plan; caisson unwatering; sand-island removal.

River Piers Built with Land Plant from Trestle of Unique Design, G. L. Freeman. *Eng. News-Rec.*, vol. 112, no. 20, May 17, 1934, pp. 621–624. Construction of piers for the Caughnawaga Bridge over the St. Lawrence River, above Montreal, by use of preframed steel tower bents, that support trestle deck, with hollow square posts through which timber spuds were driven into the bed of the river.

STEEL ARCH, AUSTRALIA. Sydney Harbor Bridge. *Engineering*, vol. 137, nos. 3562 and 3563, Apr. 20, 1934, p. 467, and Apr. 27, p. 498. Abstracts of papers read before Inst. Civil Engrs. as follows: Apr. 20: Sydney Harbor Bridge and Approaches, J. J. C. Bradfield; Design of Structure and Foundations, R. Freeman. Apr. 27: Manufacture of Structural Steelwork and Erection of Bridge, R. Freeman and L. Ennis; Calculations for Steel Superstructure, J. F. Pain and G. Roberts.

Sydney Harbor Bridge: Manufacture of Structural Steelwork and Erection of Bridge, R. Freeman and L. Ennis. *Instn. Civ. Engrs.—Min. Proc.*, no. 4922, 1934, 62 pp., 1 supp. plate. Construction of superstructure of long steel-arch and steel-truss bridge described in several previously indexed articles; manufacture of structural steelwork construction of foundations; erection of arch and other load tests on arch span; progress and rate of erection of steelwork; accidents.

STEEL TRUSS, AFRICA. Lower Zambesi Bridge. *Civ. Eng. (London)*, vol. 29, no. 334, Apr. 1934, pp. 122–126. Design and construction of steel-truss bridge at Sena, in Portuguese East Africa, having a total length of 12,064 ft, including 7 spans 165 ft in length and 33 spans 262.5 ft in length.

WELDING. Reconstruction of Bridge, C. M. Vetter. *Welding*, vol. 5, no. 2, Feb. 1934, pp. 53 and 54. Brief description of welding repairs of structural steel work on the Smithfield Street Bridge, Pittsburgh, Pa.

WOODEN. County Highway Bridge Uses New Type Timber Trusses, C. P. Martin. *Eng. News-Rec.*, vol. 112, no. 18, May 3, 1934, p. 572. Features of new type of truss utilized in 40-ft span timber bridge over Turtle Creek, about 3 miles north of Sidney, Ohio; laminated make-up of timber members alternating with board sheathing provides truss of unique design.

BUILDINGS

WIND STRESSES. Tall Building Wind Design to Be Studied by Model, G. L. Large and S. T. Carpenter. *Eng. News-Rec.*, vol. 112, no. 20, May 17, 1934, pp. 637–639. 56-story steel model, 28 feet high, being built at Ohio State University to check Spurr method of design.

CITY AND REGIONAL PLANNING

CITIES AND TOWNS. Development and Operation of Company-Owned Industrial Town, A. K. Grimmer. *Eng. Journal*, vol. 17, no. 5, May 1934, pp. 219–223. Study of development of company-owned industrial town, dealing with site, layout, housing, water supply, fire protection, and requirements for schools, hospitals, stores, and recreation.

NEED FOR PLANNING. City Planning Review Shows New Factors Need Appraisal, H. Bartholomew. *Eng. News-Rec.*, vol. 112, no. 20, May 17, 1934, pp. 639–640. Unplanned development continues to produce unsound municipal growth; slum rehabilitation is sound economic and social policy.

WASHINGTON. Washington State Planning Council Outlines Elaborate Study Program. *Eng. News-Rec.*, vol. 112, no. 23, June 7, 1934, p. 732. Program of study to investigate natural, agricultural, and industrial resources of State of Washington.

CONCRETE

BEAMS. Die einspringende Ecke des Eisenbetontraegers, H. Nitzsche. *Beton u Eisen*, vol. 32, no. 24, Dec. 20, 1933, p. 385. Theoretical mathematical analysis of stresses at reentering ends of reinforced-concrete girders; numerical examples.

HARDENING. Erhaertung von Betonkoerpern bei Frost, O. Goffin. *Beton u Eisen*, vol. 32, no. 23, Dec. 5, 1933, pp. 363 and 364. Report from laboratory of the Gutehoffnungshuette iron portland cement plant on hardening process in concrete made with high-grade iron portland cement, at temperatures as low as minus 5 c.

HYDRAULIC STRUCTURES. Application of Cementation to Water Supply Works, J. A. Ogden. *Surveyor*, vol. 85, no. 2204, Apr. 20, 1934, pp. 447–448. Reservoir construction; sealing of leakages from reservoirs; sealing of leakages through dams; tunneling in water-bearing ground. Before Liverpool Eng. Soc.

MIXING. Some New Relations Bearing on Concrete Mixtures, W. A. Blanchette. *Pub. Roads*, vol. 15, no. 3, May 1934, pp. 57–75. Experiments by the U. S. Bureau of Public Roads, at East Point, Ga., on effects of variation in proportions of solid ingredients of concrete and its water content on the quality of the resulting mixture as measured by its density and strength; effect of water-cement ratio on compressive and flexural strength; concrete-void curves; amount of water required to give maximum density and strength; effect of variation in coarse aggregate content on compressive and flexural strength.

PILES, DRIVING. Pile Driving Research. *Engineer*, vol. 157, no. 4085, Apr. 27, 1934, p. 439. Problems involved in estimating the amount of driving that a pile would stand without damage; investigation into the behavior of reinforced-concrete piles being carried out at Building Research Station; it appears that if driving conditions in practice are such that stresses less than 50 per cent of cube strength are produced, failure is unlikely to occur.

REINFORCEMENT. Hochwertiger Stahl im Eisenbetonbau, F. von Emperger. *Beton u Eisen*, vol. 32, no. 22, Nov. 20, 1933, pp. 341–352. Review of experimental studies made in German and Austrian laboratories, on the use of high-grade steel, particularly Isteg, as reinforcement for concrete beams and slabs.

TEMPERATURE EFFECT. Early Strength Concrete—Effect of Temperature, H. F. Clemmer. *Roads and Streets*, vol. 77, no. 2, Feb. 1934, pp. 62–66. Effect of raising or lowering temperatures; control of concrete in pavement construction. Before Am. Road Bldrs. Assn.

TESTING. Standard Methods of Testing Cement and Concrete Recommended by New Code of Practice. *Cement and Cement Manufacture*, vol. 7, no. 4, Apr. 1934, pp. 106–110. Provisions of new code prepared by a committee formed at the request of the Ministry of Health and the London County Council; test for organic impurities in sands; preliminary and final decantation tests for sand and other fine aggregates; sieve analysis of aggregates; preliminary and final cube tests of concrete.

VIBRATION. Relation entre les caractéristiques du béton et l'emploi de la vibration, J. Lebelle. *Génie Civil*, vol. 104, no. 15, Apr. 14, 1934, pp. 336–338. Review of modern European and American methods of concrete vibration on properties of concrete; features of concrete vibrating equipment.

CONSTRUCTION INDUSTRY

INDUSTRIAL CODES. Code of Fair Competition for Construction Industry. *Roads and Streets*, vol. 77, no. 5, May 1934, pp. 185–189. Chapter II, general contractors' division, approved by President Roosevelt, Feb. 17, 1934; proposed code for Chapter II-C, highway contractors' subdivision of general contractors' division.

DAMS

BOULDER DAM PROJECT, CONCRETE CONSTRUCTION. Construction of Boulder Dam, L. P. Sowles. *Compressed Air Mag.*, vol. 39, no. 4, Apr. 1934, pp. 4385–4396. Description of methods of pouring concrete.

BOULDER DAM PROJECT, PENSTOCKS. Steel Headers and Penstocks for Boulder Dam Mark Notable Advance in Engineering Construction, R. G. Skerrett. *Western Construction News & Highways Builder*, vol. 9, no. 3, Mar. 1934, pp. 79–83. Welding fabrication of two 30-ft penstocks and headers, totaling 14,500 ft in length; X-ray examination and stress relieving of penstock sections up to 24 ft in length.

CONCRETE GRAVITY, SPECIFICATIONS. Grand Coulee Dam and Power Plant. *U. S. Bur. Reclamation—Specifications*, no. 570, 1934, 89 pp., 56 supp. plates. Schedule, specifications, and drawings for construction of concrete-gravity dam on the Columbia River, in the state of Washington, about 3,300 ft long and 300 ft maximum height; ultimate height 500 ft, including permanent cofferdam below main dam.

EARTH, PENNSYLVANIA. Reservoir Area Supplies Fill for Rolled Earth Dam. *Construction Methods*, vol. 16, no. 5, May 1934, pp. 36–37. Construction of dam with concrete corewalls on Tar Run, near Pottsville, Pa., to provide emergency storage supply of 200,000,000 gal; length of crest 1,785 ft; maximum height from stream bed 50 ft; width of embankment at top 20 ft; flooded area of reservoir 48 acres.

EROSION, CHECK DAMS. Capacity of Outlets for Erosion-Control Dams, C. E. Ramser. *Eng. News-Rec.*, vol. 112, no. 19, May 10, 1934, pp. 596–599. Hydraulic characteristics and discharge capacities of drop-inlet pipe and box culverts used as outlets for small dams built on soil-saving projects.

WEIRS. Practical Hydraulics—1, P. S. Wilson. *Water Works & Sewerage*, vol. 81, no. 4, Apr. 1934, pp. 119–120. Formulas for use with rectangular sharp-crest weirs; discharge of sharp-crest weir per foot of length by Francis formula.

FLOOD CONTROL

RIVERS, IMPROVEMENT. Regulation of Fen Ho for Flood Protection and Conservancy of Winter Flow as Aid to Irrigation—1, O. J. Todd. *Far Eastern Rev.*, vol. 30, no. 4, Apr. 1934, pp. 165–171. Report on surveys made in 1933, for Shansi Water Conservancy Commission, on regulation and utilization of tributary of Yellow River; financing and progress of work; river training; reservoir surveys; levels and bench marks; surveys of irrigation districts; diversion dams in Taiyuan-Fenchow-Chiehsiu Valley; hydrographic and silt studies.

RIVERS, REVETMENT. River Revetment Uses Pre-Cast Tetrahedrons. *Construction Methods*, vol. 16, no. 3, Mar. 1934, p. 50. Method of manufacture of 6,780,000 four-sided concrete blocks or "tetrahedrons" to be used in reveting the slopes of the Mississippi River south of Memphis; the blocks measure 14½ in. on each side and have an altitude of 12 in.

FOUNDATIONS

DESIGN. Practical Hints on Foundation Problems, A. M. Bouillon. *Military Engr.*, vol. 26, no. 147, May-June 1934, pp. 217–224. Discussion of data that should be included in the investigation of the foundation project; selection of type; examples of failures; effect of vibrations on foundations.

PILES, CONCRETE. Step-Tapered Piles Penetrate Cemented Boulder Formation. *Construction Methods*, vol. 16, no. 3, Mar. 1934, pp. 44–46. Features of step-tapered pile recently developed by the Raymond Concrete Pile Company; taper is provided by stepped increments in diameter; spirally corrugated steel shell, in 8-ft sections, is driven into ground by impact of hammer blows transmitted through steel core to welded rings on inside of sections.

RETAINING WALLS, EARTH PRESSURE. Retaining-Wall Design for Fifteen-Mile Falls Dams, K. Terzaghi. *Eng. News-Rec.*, vol. 112, no. 20, May 17, 1934, pp. 632–636. Application of large retaining-wall tests and discussion of results in designing wall 900 ft long and 170 ft high separating concrete and embankment parts for large Connecticut River dam.

RETAINING WALLS, MASONRY. Mountain Highway Retained by Stone Masonry Walls. *Construction Methods*, vol. 16, no. 2, Feb. 1934, pp. 38 and 39. Construction of stone masonry retaining walls up to 33 ft deep and parapet walls devoid of coping for New York State Department of Public Works, between Port Jervis and Mongaup.

HYDROLOGY, METEOROLOGY, AND SEISMOGRAPHY

ANEMOMETERS. Wind of 231-Mile Velocity Recorded in New Hampshire. *Eng. News-Rec.*, vol. 112, no. 19, May 10, 1934, pp. 604 and 605. Features of new rugged anemometer of Mt. Washington observatory, designed to withstand super-hurricane velocities; anemometer consists of copper disc equipped with six half-cups and enclosing electric heater.

BEACHES, EROSION. Shore Erosion in Tidewater Maryland, J. A. Bromley. *Baltimore Engr.*, vol. 8, no. 9, Mar. 1934, pp. 3–5, and 12. Seriousness of problem and need for creation of State Erosion Board. Before Maryland Assn. Engrs.

EARTHQUAKES. Lunar Periodicity of Earthquakes, C. Davison. *London, Edinburgh, and Dublin Philosophical Mag. and Journal, Science*, vol. 17, no. 114, Apr. 1934, pp. 737–752. Statistical study of recent earthquakes and aftershocks showing relationship between the periodicity of earthquakes and the phases of the moon.

METEOROLOGY. North American Air Mass Properties, H. C. Willett. *Aeronautical Sciences—Journal*, vol. 1, no. 2, Apr. 1934, pp. 78–87. Classification of air masses; significance of properties of principal air mass types.

STREAM FLOW, JAPAN. Stream Flow Study of Tokyo Water Supply, T. Iwasaki. *Am. Water Works Assn.—Journal*, vol. 26, no. 2, Feb. 1934, pp. 163–175. Study of precipitation-runoff relationships of the river Tama having a watershed of 157 sq mile; comparison of actual runoff and runoff calculated by correcting monthly rainfall; deflection curve of river Tama; standard depletion curve data; rainfall influence lines; comparison of actual runoff and runoff calculated by rainfall influence line method.

INLAND WATERWAYS

RIVERS. Harnessing the Nile, R. A. Ryves. *Civ. Eng. (London)*, vol. 29, no. 334, Apr. 1934, pp. 132–134. Problem of Sudd region, Nile watershed; diversion of swamp affluents; study of swamp vegetation; Lake Albert Dam; canalization of Sudd region.

IRRIGATION

PUMPING PLANTS. Notes on Pumping Plants for Irrigation and Drainage Areas in Murray Basin, H. G. Tolley. *Instn. Engrs. Australia—Journal*, vol. 6, no. 3, Mar. 1934, pp. 73–78. Problems in design of irrigation or reclamation scheme; engine selection; analysis of cost of water pumped.

SOUTH AFRICA. Kalahari Irrigation Scheme. *Engineer*, vol. 157, no. 4086, May 4, 1934, p. 464. Brief note on an aerial photographic investigation of the possibility of making the water at Molopo, the great river of Kalahari, turn back to its old course and flow into the Orange River and the sea.

LAND RECLAMATION AND DRAINAGE

CULVERTS, CONSTRUCTION. Hows and Whys of Jacking Culverts. *Ry. Eng. and Maintenance*, vol. 30, no. 5, May 1934; pp. 264–266 and 268. Report of the Committee on Roadway of the American Railway Engineering Association, giving a résumé of the best practices of pipe installation of this method.

ITALY. Reclamation of Pontine Marshes. *Engineer*, vol. 157, nos. 4087 and 4088, May 11, 1934, pp. 484–485, and May 18, pp. 509–511. Account of some measures taken by Fascist Government; law of Bonifica integrale, commonly known as Mussolini Law, 1928; represents unification of old distinct conceptions of hydraulic, hygienic, and agrarian bonification; reclamation of marshes; drainage works; control of mountain waters; technical equipment; treatment of reclaimed land; colonization.

MACEDONIA. Reclamation Works of Eastern Macedonia. R. W. Gausmann. *Military Engr.*, vol. 26, no. 147, May-June 1934, pp. 182–185. History of area; work to prevent floods; drainage of Lake Ahinos; excavation machinery.

RAILROAD TRACK, DRAINAGE. Sound Roadbed Pays Its Way. *Ry. Eng. and Maintenance*, vol. 30, no. 5, May 1934, pp. 260–263. Method used by the Lehigh Valley Railroad Company to maintain an adequate subsurface drainage system; embankment wash and erosion prevented by heavy riprapped river banks.

ROADS AND STREETS. Protecting Inclined Roads from Washouts. *Eng. & Min. Journal*, vol. 135, no. 4, Apr. 1934, p. 163. Brief item on use of two 2 by 6-in. timbers, with spreader blocks to provide diagonal drain to keep runoff water from following wheel ruts and eroding road binding material.

PORTS AND MARITIME STRUCTURES

BALTIMORE, MD. Port of Baltimore, Md., Bureau of Marine Development—United States Shipping Board—Corps of Engineers, United States Army. Washington, U. S. Government Printing Office. Port Series, no. 16, part 1, 1934. 328 pp., figs., diagrs., charts, tables, supp. sheets. Price 50 cents. Revised edition of general data and statistical information on port and harbor conditions, customs and regulations, services and charges, fuel, storage facilities and communications; commercial statistics.

BREMEN. German Seaport of Bremen. *Naut. Gaz.*, vol. 124, no. 7, Mar. 31, 1934, pp. 11–13 and 30. Approximately 80 per cent of seabound traffic received from or transferred to railways; 13 basins for handling transoceanic freight; due to character as railway port, harbor basins have relatively small width; harbors, constantly being enlarged and improved to meet demands of ocean traffic, equipped with 278 cranes, most of which are electrically driven; quay sheds, for storage of freight, have total floor space of 437,000 sq yd.

CONCRETE. Test of Reinforced Concrete Wharf, W. E. J. Beeching. *Concrete and Constr. Eng.*, vol. 29, no. 4, Apr. 1934, pp. 269–271. Tests on wharf consisting of reinforced concrete sheet pile wall, 250 ft long, designed for uniform load of 5 cwt per sq ft, superimposed on filling at top level of wharf, and of rail track taking two 12-ton wagons and one 4-ton crane.

HAMBURG. Port of Hamburg. *Naut. Gaz.*, vol. 124, no. 7, Mar. 31, 1934, pp. 9–10 and 30. Port consists of 30 harbor basins for sea-going ships and 20 others for river crafts, with total water frontage of 105 miles and ample railroad connections; port serves as place of transshipment, distribution, and warehousing for large hinterland reaching far beyond the frontiers of Germany; two methods of transshipment are principally used, one being accomplished in midstream and the other alongside piers; map showing harbor basins for transshipment from regular lines.

HAVRE, FRANCE. Heavy Engineering Works at Port of Havre, E. E. R. Tratman. *Eng. News-Rec.*, vol. 112, no. 24, June 14, 1934, pp. 768–771. Four types of modern quay construction at French seaport, including solid and hollow walls, arch spans, and trestle design with precast members; seawall construction and large caisson work in harbor entrance.

JETTIES. Mustapha Jetty, Algiers. *Engineer*, vol. 157, no. 4087, May 11, 1934, pp. 475–477 and 481. So-called cyclopean concrete-block construction, involving use of blocks of large size was adopted; breakwater, 1,200 m long, consists of wall of concrete blocks founded at depth of 15 m below low-water zero on mound of rubble stone on average 5 m deep; weight of each foundation block is 450 tons and that of each of three blocks superimposed on it to form pillar, is 400 tons; details of construction methods.

PIERS, FIRE STOPS. Wrought-Iron Fire Stops Installed Below Timber Pier Decks. *Eng. News-Rec.*, vol. 112, no. 21, May 24, 1934, p. 668. Description of fire stops consisting of plates of wrought iron extending from lower sides of deck to mean low water added to three piers of Pennsylvania Railroad produce terminal in New York last year as means of checking spread of fire below pier deck.

ROADS AND STREETS

BITUMINOUS. General Outline of Construction of Low Cost Bituminous Roads, J. T. Pauls. *Roads & Streets*, vol. 77, no. 4, Apr. 1934, pp. 129–133. Subgrade considerations; low-cost work on sandy soils; influence of local materials on design; construction procedure for surface treatment; typical examples of bituminous surface courses; tests and requirements for liquid asphaltic materials. Before Mich. Highway Conference.

What Is Rolling? B. E. Gray. *Pub. Works*, vol. 65, no. 6, June 1934, pp. 32–34. Important requirements for finishing bituminous pavements; functions and correct use of roller.

CONCRETE. Experiences in Use of Early-Strength Concrete, H. F. Clemmer. *Pub. Works*, vol. 65, no. 4, Apr. 1934, pp. 23–24. Laboratory investigation by highway department of District of Columbia of relative strengths of concretes maintained, while curing, at temperatures of 40, 50, and 70 F; effect of rising and falling temperatures immediately after placing of concrete; standard specifications for base concrete. Before Am. Road Builders' Assn.

Father Labelle Highway near Montreal Embodies Features New to Concrete Road Construction in Canada, D. O. Robinson. *Eng. & Contract. Rec.*, vol. 48, no. 21, May 23, 1934, pp. 445–448. Seven-mile, three-lane section, 30 ft wide; concrete is 7 in. thick in center and 8 in. thick at edges; specifications and construction methods.

FROST DAMAGE. Frost Heave in Highways: Its Occurrence and Prevention. *Pub. Works*, vol. 65, nos. 4 and 5, Apr. 1934, pp. 40–42, and May, pp. 31–32 and 34. April: Effect on various pavement materials; influence of soil profile on heaving. May: Preventive measures.

GRADING. Observations on Bulldozers and Large Scrapers in Grading Work. A. P. Anderson. *Pub. Roads*, vol. 15, no. 3, May 1934, pp. 78–81. Field study of use of large tractor-powered bulldozers as actual excavating units and of large-capacity scrapers in highway grading; bulldozers used in conjunction with power shovel; operating characteristics of large tractor-drawn scrapers.

HIGHWAY ENGINEERING, UNION OF SOVIET SOCIALISTIC REPUBLICS. Russian Road Problems, K. Krueger. *Roads and Road Construction*, vol. 12, no. 135, Mar. 1, 1934, pp. 70 and 71. Road planning; position of foreign engineers and foreign expert labor; mechanization of road building; Russian imports of road machinery; quarrying; research; road building methods.

MAINTENANCE AND REPAIR. Road Maintenance Costs in Rhode Island. *Pub. Works*, vol. 65, no. 2, Feb. 1934, pp. 23 and 26. Average cost in cents, of all pavements of each age-year.

MATERIALS, BITUMINOUS. Fortschritte auf dem Gebiete der Bituminoesen Strassenbau-Bindemittel, H. Mallison. *Chemiker-Ztg.*, vol. 58, no. 9, Jan. 31, 1934, pp. 93–95. Progress in the field of bituminous binders for road construction.

PLANNING. How National Planning Can Help in Development of Major Highway System, E. W. James. *Roads & Streets*, vol. 77, no. 4, Apr. 1934, pp. 154–156. Contemplation of effect of balancing governmental budgets, limiting use of land, intensive regional development, and development of agricultural-industrial combination centers on highway requirements.

RAILROAD CROSSINGS, DESIGN. Recent Developments in Grade Separation Structures. C. P. Disney. *Roads & Streets*, vol. 77, no. 5, May 1934, pp. 195–198. Work of Central Region of Canadian National Railway in developing six types of grade separations, which are described; features are shallow decks, low cost, simple construction, and easy maintenance. Before Western Soc. Engrs.

SNOW REMOVAL. Snow Fighting Through a Transcontinental Pass. C. E. Learned. *Roads & Streets*, vol. 77, no. 3, Mar. 1934, pp. 91–93. Snow removal considered in design and location; drift prevention measures taken; snow-fighting organization; snow-removal equipment; snow-fighting methods; costs of snow removal on 30-mile section of highway through Berthoud Pass, Colo.

SURFACE TREATMENT. Resurfacing Streets and Highways, J. S. Crandell. *Am. City*, vol. 49, no. 6, June 1934, pp. 69–71. Selection of proper type of resurface for various types of pavement such as gravel, macadam, bituminous macadam, retread, bituminous concrete, sheet asphalt, cold mixes gone bad, brick and concrete. Before Twentieth Annual Road School, Purdue Univ.

UNITED STATES. Summary of Federal Highway Progress Under $400,000,000 Allotment, T. H. MacDonald. *Roads & Streets*, vol. 77, no. 2, Feb. 1934, pp. 59–61. Outline of principles of general plan; list of U.S. Public Works highway projects by types of construction as for Dec. 31, 1933. Before Am. Road Bldrs. Assn.

SEWERAGE AND SEWAGE DISPOSAL

ACTIVATED SLUDGE. Dewatering Sewage Sludge by Vacuum Filters at Hagerstown, Md., W. Donaldson. *Water Works & Sewerage*, vol. 81, no. 5, May 1934, pp. 139–144. Use of vacuum filters for dewatering undigested fine screenings, fresh solids, and excess activated sludge; description of sludge filter house and equipment; operating costs.

Modernizing and Enlarging Activated-Sludge Plant, E. W. Whitlock. *Eng. News-Rec.*, vol. 112, no. 23, June 7, 1934, pp. 733–737. Remodeling of 4-mgd plant of Hagerstown, Md.; sewage-treatment facilities extended by constructing grease chamber, preliminary settling tanks, and diffused-air aeration tanks; mechanical dewatering of undigested sludge proves highly efficient; general operating data and sludge-filtering data for Mar. 1934; cost data.

AERATION. Installation and Servicing of Porous Air Diffuser Mediums, F. C. Roe. *Water Works & Sewerage*, vol. 81, no. 4, Apr. 1934, pp. 115–118. Sources of diffuser pore obstruction and methods of prevention.

CHLORINATION. Chlorination in Sewage Disposal. *Water Works & Sewerage*, vol. 81, no. 4, Apr. 1934, pp. 133–134. Discussion of report of Committee on Sewage Disposal of American Public Health Assn. by L. H. Enslow, M. F. Trice, R. J. Morton, W. J. Scott, E. S. Chase, L. F. Warrick, C. A. Holmquist, C. M. Baker, and F. H. Waring.

CONSTRUCTION. Building Sewers Under Difficult Conditions, F. C. Zeigler. *Pub. Works*, vol. 65, no. 5, May 1934, pp. 9–10. Proper control of subsurface water conditions; proper handling of materials to be excavated to secure firm, undisturbed subgrade without loss or shifting of adjacent ground. Before N. Y. State Sewage Works Assn.

DEARBORN, MICH. Performance of Dearborn's Chemical Sewage Treatment Plant, A. M. Buswell. *Water Works & Sewerage*, vol. 81, no. 3, Mar. 1934, pp. 87–91. Results of 30-day test of Laughlin process and screen filter.

DISPOSAL METHODS. Meeting of New England Sewage Works Association. *Water Works & Sewerage*, vol. 81, no. 6, June 1934, pp. 223–272. Proceedings and abstracts of papers: Chlorine Disinfection of Sewages, W. J. Scott; Recent Developments in Sewage Treatment in Germany and Belgium, W. Rudolfs; Sewage Treatment in Greenwich, Conn., G. E. Griffin.

So reinigt man Abwaesser—I and II, H. Bach. *Chemiker-Ztg.*, vol. 58, nos. 3 and 4, Jan. 10, 1934, pp. 33–35, and Jan. 13, pp. 46–48. How sewage is purified; various processes and their applicability discussed, including both mechanical and biological processes, aerobic and anaerobic; activated-sludge process, when functioning properly, produces effluent of good quality.

FORT ATKINSON, WIS. Sewage Disposal Plant Designed for Economical Operation, R. Cramer. *Am. City*, vol. 49, no. 6, June 1934, pp. 78–79. Plant with apparatus designed for low power consumption, gas generated in sludge digester utilized, and revenue gained through sale of fertilizer.

HYDROGEN-ION CONCENTRATION. Determination of pH of Sewage Sludges, W. D. Hatfield and K. Morkert. *Sewage Works Journal*, vol. 6, no. 2, Mar. 1934, pp. 246–249. Critical study of colorimetric method for determination of hydrogen-ion concentration of sewage sludges leading to its approval by authors; precautions to be used in procedure by this method.

RECENT PROGRESS. Developments in Sewerage and Sewage Treatment During 1933, H. P. Eddy. *Water Works & Sewerage*, vol. 81, no. 2, Feb. 1934, pp. 39–44. Sewer and disposal plant construction in municipalities in the United States; measuring and controlling rate of flow; sludge conditioning and dewatering; chlorination; chemical precipitation.

SEWERS, ASSESSMENTS. Law of Sewer Assessments. L. T. Parker. *Mun. Sanitation*, vol. 5, no. 2, Feb. 1934, pp. 55, 56, and 59. Review of recent court decisions; how to determine the validity of assessments; appropriation of land.

SLUDGE. Prefiltration Treatment of Sewage Sludge, F. W. Mohlman and G. P. Edwards. *Indus. and Eng. Chem.*, vol. 26, no. 2, Feb. 1934, pp. 226–230. Chemicals and filter aids used to condition sludge prior to filtration, tested with comparative data on rates of filtration through Buechner filters; materials compared as to rates of filtration, economy, and practicability when used with various types of sludges.

SLUDGE. New Method of Sludge Drying, J. R. Downe. *Water Works & Sewerage*, vol. 81, no. 6, June 1934, pp. 210–211. Application of spray-drying system at Plainfield, N.J.

SLUDGE DISPOSAL. New Device for Hauling and Dumping Dried Sewage Sludge, W. B. Walraven. *Water Works & Sewerage*, vol. 81, no. 2, Feb. 1934, p. 57. Crawler-type tractor with side-dump sludge bins; capacity of 2¼ cu yd of sludge; dumping levers operated from driver's seat; built by Allis-Chalmers Mfg. Co., Springfield, Ill., for sewage treatment works.

SLUDGE HANDLING. Sludge Problems. *Mun. Sanitation*, vol. 5, no. 4, Apr. 1934, pp. 125 and 126. Brief review of papers by I. R. Riker, E. F. Lawler, J. R. Downes, C. G. Wigley, G. M. Fair, W. Rudolfs, M. H. Cowles, A. E. Griffin, S. Vermilye, H. Heukelekian, F. A. Hoffman, I. O. Lacy, S. L. Dorsey, and E. T. Killam.

STORM SEWERS. Rational Storm Drain Design Practice in Los Angeles. *Pub. Works*, vol. 65, no. 6, June 1934, pp. 38–40. Résumé of methods employed in Los Angeles for computing required capacity of storm drains.

UNITED STATES. Some Recent Developments in Sewage Treatment Practice, W. Donaldson. *Mun. Sanitation*, vol. 5, no. 1, Jan. 1934, pp. 11–12 and 23. Activated sludge; chemical precipitation in sewage treatment; chlorination; filtration of sewage effluents; filtration of sludges. Before Va. Water & Sewage Works Assn.

WASTE UTILIZATION. Utilization of Sewage, N. T. Veatch, Jr. *Water Works & Sewerage*, vol. 81, no. 6, June 1934, pp. 177 and 178. Water, fertilizer, and gas values of sewage.

WATER ANALYSIS. Equipment for Water and Sewage Laboratories, T. M. Riddick. *Water Works & Sewerage*, vol. 81, no. 5, May 1934, pp. 151–153. First of series of articles dealing with water and sewage analysis apparatus developed and constructed in small laboratories; description of 20-deg incubator for determination of bio-chemical oxygen demand.

STRUCTURAL ENGINEERING

BEAMS. Determining Beam Deflections by Trigonometric Series, A. A. Jakkula. *Eng. News-Rec.*, vol. 112, no. 21, May 24, 1934, pp. 664–665. Application of methods developed by S. Timoshenko and others for design of suspension bridges; table showing convergence of trigonometric series. Bibliography.

SLABS, STRESSES. Concentrated Loads on Slabs, C. T. Morris. *Ohio State Univ. Studies—Eng. Experiment Station—Bull.*, no. 80, vol. 2, no. 6, Nov. 1933, 20 pp. Report on part of work of Committee on Masonry of Structural Division of American Society of Civil Engineers for presentation at Annual Meeting of Society, Jan. 18, 1934, as progress report of Committee; single central load; two central loads on parallel elements; two loads on element; four loads on two parallel elements; slabs of limited width; eccentric loads on slabs; effect of transverse beams.

SURVEYING

ROADS AND STREETS. Aerial Photographic Surveys for Highway Right-of-Way Problems, A. Abrams. *Roads & Streets*, vol. 77, no. 2, Feb. 1934, pp. 69–71. Mapping operations carried on at elevation of 2 or 3 miles; accuracy of map negatives; uses of photographic maps. Before Am. Road Bldrs' Assn.

TUNNELS

CONSTRUCTION. Small Compressed-Air Tunnel Driven Without Shield. *Eng. News-Rec.*, vol. 112, no. 20, May 17, 1934, pp. 630 and 631. Pressed-steel liner plates carried tight against face in 8-ft cable-duct tunnel, 588 ft long, under Passaic River, at Newark, N.J.; 12-in. concrete lining placed by hand.

VENTILATION. Designing Tunnel Ventilation for Construction Use, G. F. Maughmer. *Eng. News-Rec.*, vol. 112, no. 19, May 10, 1934, pp. 597–602. Design of plant for 193,000 ft of Colorado River Aqueduct tunnels; pipe size; volume of air required; pipe friction in ventilation systems, exhausting and blowing, for various sizes of pipe up to 18,000 ft in length; total cost of power, pipe, and compressors for various sizes of pipe; characteristics of dual-compressor arrangement; operating characteristics.

WATER TREATMENT

DRINKING WATER, RADIUM POISONING. Radium Poisoning in Water, L. B. Loeb. *Am. Water Works Assn.—Journal*, vol. 26, no. 4, Apr. 1934, pp. 461–476. Summary of data leading to conclusion that "anyone who knowingly sells water containing radium, radon, or thorium preparations is guilty of fraud or homicide"; nature of radioactivity and radium; distribution of radium and radon in earth's crust; biological action of radioactive products; proper medical radium or X-ray treatment; ingestion of radium by human body; radium and radon elimination in body. Bibliography.

FILTRATION PLANTS, MILWAUKEE, WIS. Another Great Lakes City Plans Filter Plant, L. R. Howson. *Eng. News-Rec.*, vol. 112, no. 22, May 31, 1934, pp. 709–712. Description of plant and cost of construction for filtering Great Lakes water supply, Milwaukee, Wis.; daily pumpage of water in Milwaukee; 1933 Schwada report; plant arrangement; filters; double-deck shallow coagulation basins with flocculators at inlet end; breakwater construction.

FILTRATION PLANTS, MIXERS. Dual Flow Compartment Type Mixer, H. G. Menke. *Water Works & Sewerage*, vol. 81, no. 2, Feb. 1934, pp. 45 and 46. Advantages of properly mixing coagulating chemicals with water prepared for filtration into rapid sand filters; type of mixer designed by Alabama State Department of Public Health, consisting of series of compartments, usually five, in which water flows upward and downward in each compartment; upward flow induced by jet action of submerged horizontal orifice, and downward flow the result of gravitation.

FILTRATION PLANTS, SAMPLERS. Atlanta Water Sampler, P. Weir and J. W. Allen. *Water Works & Sewerage*, vol. 81, no. 3, Mar. 1934, pp. 101–102. Description, operation, and value of sampler installation for control of operation in filtration plants, Atlanta, Ga.

FILTRATION PLANTS, WILMETTE, ILL. Building Filter Plant Financed by RFC. *Eng. News-Rec.*, vol. 112, no. 22, May 31, 1934, pp. 692–697. Description of new 6-mgd filtration plant of Wilmette, Ill.; to preserve view of Lake Michigan, plant is built low and provided with promenade roof; details of inlet drum at end of intake pipe, installed 3,000 ft out in lake in 23 ft of water, designed to minimize vortex action and attendant ice troubles; storage of washwater; preliminary treatment.

SOFTENING. Estimating Hardness Removal from Surface Water Supplies, P. C. Stein. *Am. Water Works Assn.—Journal*, vol. 26, no. 3, Mar. 1934, pp. 371–378. Adaptation of stream flow duration curve to give hardness duration curve, illustrated by typical problem involving Shenandoah River, to show not only nature and maximum concentrations of hardness, but also relationships which exist between hardness variation and time.

SOFTENING, EVANSVILLE, WIS. Unconventional Design Features in New Water-Softening Plant. *Eng. News-Rec.*, vol. 112, no. 19, May 10, 1934, pp. 602–603. Features of water softening plant of Evansville, Wis., having capacity of 700,000 gal per day; open space beneath settling basins and filters utilized for raw-water basin; paddle-agitator mixing provided within cylindrical timber reaction-tube; automatic shut-down; sludge-removal system.

TREATMENT, NEW YORK CITY. New York Supply Requires Diversity of Treatment, F. E. Hale. *Eng. News-Rec.*, vol. 112, no. 22, May 31, 1934, pp. 703–706. Wide variety of types of water supplied to New York makes it necessary to consider pollution, turbidity, hardness, aggressiveness, tastes, odors, and microorganisms; sewage plants operated to protect watersheds; protecting mountain supplies; chlorination; work of laboratory division.

WATER WORKS ENGINEERING

RATE MAKING. Round Table. *Water Works Eng.*, vol. 87, no. 5, Mar. 7, 1934, pp. 213–215. Practical discussion of rates charged by small water systems.

WILMETTE, ILL. Water Works of Wilmette, Illinois, J. W. Nemoyer. *Am. Water Works Assn.—Journal*, vol. 26, no. 3, Mar. 1934, pp. 334–337. Brief description of works.

WORKMEN'S COMPENSATION. City Must Protect Employees, L. T. Parker. *Water Works Eng.*, vol. 87, no. 10, May 16, 1934, pp. 467–469. Court decisions showing when city is liable for employee's injuries through negligence; when employee assumes risk; water works' duty when supplying simple tools; when employee is not entitled to damages for injury; when employee is within scope of employment.

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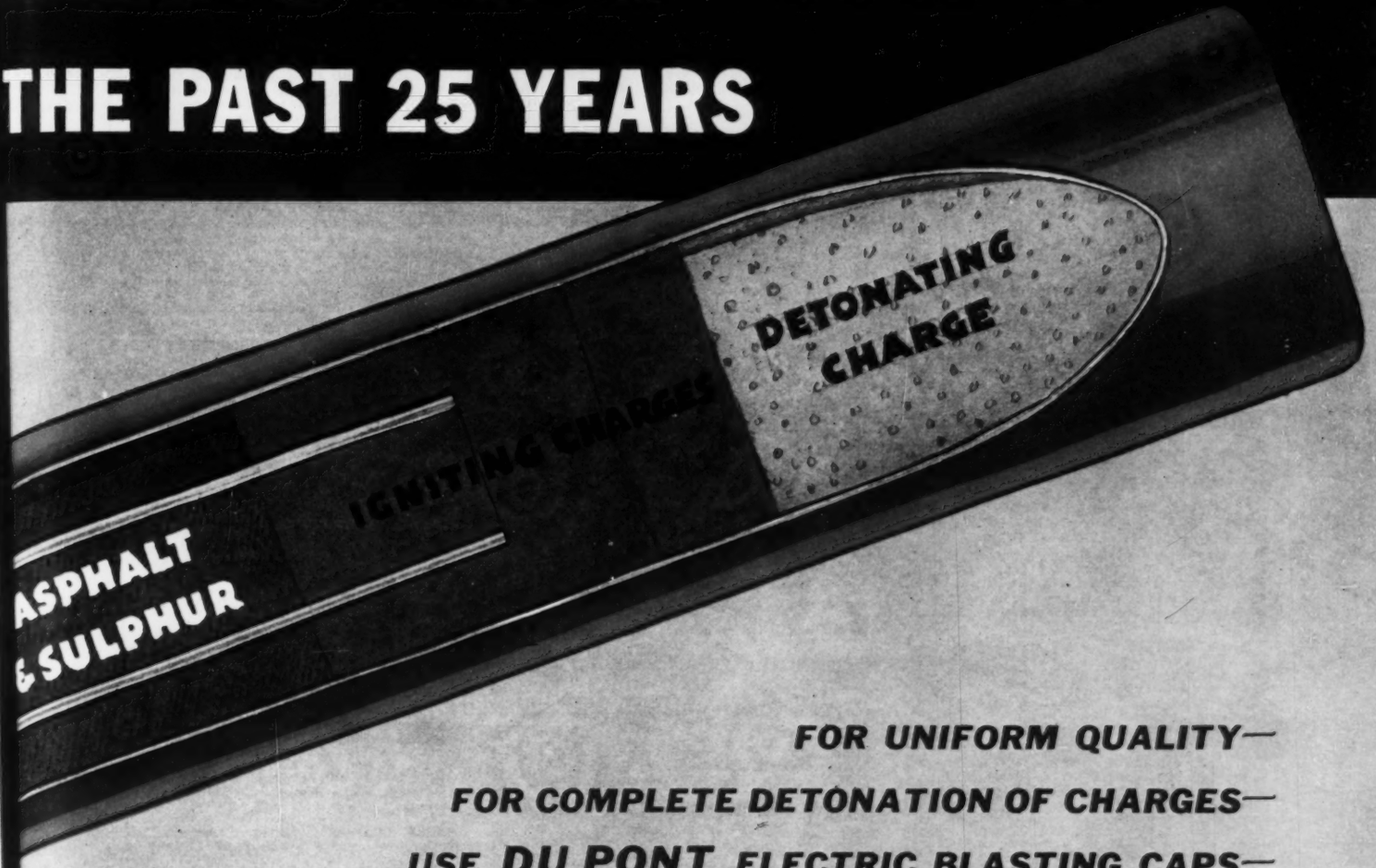

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BRIDGES

CONCRETE ARCH, GERMANY. Die Adolf-Hitler-Bruecke ueber die Mosel, F. Dischinger. *VDI Zeit*, vol. 78, no. 24, June 16, 1934, pp. 747–753. Author's design of three reinforced concrete, 3-hinged arches, from 90 to 107 m in span, rising from 8.1 to 8.4 m, and forming the main part of the Adolf Hitler Bridge over the Mosel River, Germany; total length about 550 m; longest arch is of cellular construction; cost data.

LIFT, NETHERLANDS. Barendrecht Lift Bridge. *Engineer*, vol. 157, no. 4091, June 8, 1934, pp. 580 and 582. New bridge over the Oude-Meuse Waterway in Holland, said to be the largest of its kind on the continent; it is of the balanced counterweight type and was built from de Klerk's designs.

PIERS, RECONSTRUCTION. New Pier Constructed Under Tilted Bridge Tower, J. W. Beretta. *Eng. News-Rec.*, vol. 112, no. 24, June 14, 1934, pp. 777 and 778. Rio Grande suspension bridge at Hidalgo, Tex., damaged in the 1933 floods, repaired by retrieving the tower from a precarious position.

RAILROAD, RECONSTRUCTION. Las obras de reconstruccion del cuarto paso sobre el rio Matarrana, en la linea de Zaragoza a Barcelona por Caspe, F. Moneva. *Revista de Obras Publicas*, vol. 82, no. 2641, Mar. 15, 1934, pp. 105–113. Description of reconstruction work at the fourth crossing over the Matarrana River, on the railroad line from Zaragoza to Barcelona via Caspe, where a falling cliff destroyed part of the bridge at the tunnel portal.

RIGID FRAME. Rigid Frame Highway Bridges in Ontario, A. Sedgwick. *Am. Concrete Inst.—Journal*, vol. 5, no. 5, May-June 1934, pp. 479–484. Review of Canadian practice in design and construction of rigid-frame concrete highway bridges.

STEEL, ROLLERS. Bearing Value of Rollers, W. M. Wilson. *Univ. Ill.—Eng. Experiment Station—Bull.*, no. 265, vol. 31, no. 24, Feb. 13, 1934, 32 pp. Investigation to determine the load-carrying capacity of small rollers similar to those used as expansion rollers and rockers of girder and truss bridges; both static and rolling tests included.

STEEL TRUSS. Illinois Bridge Reflects Careful Study of Details, G. Jeppesen. *Eng. News-Rec.*, vol. 112, no. 26, June 28, 1934, pp. 841–843. Description of recently completed through-cantilever structure, of 500-ft span, over the Illinois Waterway at Ottawa, Ill., planned for simplicity of framing and ease and speed of erection; total length 1,006 ft.

SWING. Chicoutimi Swing Span Requires Huge Protection Pier. *Eng. News-Rec.*, vol. 113, no. 1, July 5, 1934, pp. 1–3. Description of new 7-span bridge over the Saguenay River at Chicoutimi, Quebec, including 375-ft swing span protected, in open position, by timber and concrete pier 430 ft long enclosed in steel sheetpiling.

VIADUCTS, STEEL. High Steel Trestle Moved Intact to New Location. *Eng. News-Rec.*, vol. 112, no. 25, June 21, 1934, pp. 793–795. Old 6-span deck-truss structure across Rock Creek in Washington, D. C., 750 ft long, 1,226 tons in weight, is shifted 80 ft to make way for a new multiple-arch concrete structure; old bridge to serve as a detour during construction; preparations for moving with capstans.

BUILDINGS

AIR CONDITIONING. Broker Pioneers in Customer-Comfort, R. G. Hutchinson and D. W. Ramsay. *Elec. World*, vol. 103, no. 26, June 30, 1934, pp. 951–952. Details of pioneer installation in broker's office; total volume of 3,600 cu ft per min was adopted, giving average air change every 5.8 min; tests of operation showed gentle air motion with sufficiently high entering-air temperature to preclude possibility of cold spots or drafts.

EARTHQUAKES, CALIFORNIA. California Makes Progress Against Earthquake Hazard, N. A. Bowers. *Eng. News-Rec.*, vol. 113, no. 1, July 5, 1934, pp. 14–17. Since the Long Beach earthquake in 1933 more enlightened views on seismic risk have been adopted; new laws, new ordinances, statewide checking of public school buildings; advisory committees on resistant design; building codes and society action.

WALLS, MASONRY. Joist Anchors in Masonry Walls Tested for Earthquake Resistance, N. B. Green and A. C. Horner. *Eng. News-Rec.*, vol. 113, no. 2, July 12, 1934, pp. 35–38. Tests of anchor bolts in masonry walls, intended to aid in the development of better methods for construction of bearing-wall buildings, indicating that more efficient floor-to-wall assemblies are possible, and pointing to plate anchors, deeper embedment, and use of blocking between joists as detail improvements.

CITY AND REGIONAL PLANNING

PORTS AND HARBORS. Town Planning Aspects of Vancouver and Fraser River Harbours, W. G. Swan. *Eng. Journal*, vol. 17, no. 7, July 1934, pp. 299–307. Present developments in three divisions of Vancouver Harbor and along the Fraser River, with reference to such matters as administration, zoning, railway and road transportation, industrial and residential areas, and harbor facilities; problems involved in possible future developments. Before Eng. Inst. Canada.

ZONING. Report of Committee on City Planning and Zoning. *Nat. Fire Protection Assn.—Advance Publ.*, mtg., May 14–17, 1934, 31 pp. City planning and zoning in relation to fire prevention and protection.

CONCRETE

AGGREGATES. Does Cement Protect Poor Quality Aggregate?—Yes and No, E. Viens. *Am. Concrete Inst.—Journal*, vol. 5, no. 5, May-June 1934, pp. 437–447. Author quotes cases showing that some aggregate will cause 2,000-lb, 28-day concrete to deteriorate much sooner than would concrete of like design with much better aggregate; however, some aggregate now durable in 2,000-lb concrete, will give entire satisfaction in from 3,500 to 4,000-lb concrete.

BEAMS. Tests of Reinforced Concrete T-Beams, T. D. Mylrea. *Am. Concrete Inst.—Journal*, vol. 5, no. 5, May-June 1934, pp. 448–464. Tests of concrete T-beams reinforced in accordance with F. Scott's system; with proper anchorage it is possible to develop elastic limit of any steel likely to come into commercial use; with proper bending and anchorage question of bond is eliminated, and shear stresses are governed only by strength of concrete in diagonal compression.

BONDING. Bonding of New Concrete to Old at Horizontal Construction Joints, R. E. Davis and H. E. Davis. *Am. Concrete Inst.—Journal*, vol. 5, no. 5, May-June 1934, pp. 422–436. Tests carried out at the University of California to determine the relative efficiency of various methods of bonding new concrete to old under conditions similar to those existing along horizontal joints in dams; effect of placement and methods of joint preparation; various periods of drying of surface of lower lift, drying temperature, time-interval between lifts, type of cement, and richness of mix.

DESIGN. Ueber Materialechtheit im Betonbau, S. Kiehne. *Zement*, vol. 23, nos. 9 and 10, Mar. 1, 1934, pp. 119–122, and Mar. 8, pp. 130–135. Genuineness of material in concrete construction; author seeks to present basic character of concrete and reinforced concrete construction, from standpoint of engineer, for guidance of architect in design of concrete structures that conform to materials employed.

DESIGN, EUROPE. Observations on European Practice in Concrete Design and Construction, B. Moreell. *Am. Concrete Inst.—Journal*, vol. 5, no. 5, May-June 1934, pp. 391–406. Review of European practice as to reinforcing steel, cement, aggregates, calculation of strength, shrinkage and temperature changes, design loads, compression and tension steel, buckling, bond, diagonal tension reinforcement, and lateral reinforcement for compression members.

GRAIN ELEVATORS. New Grain Warehouse at Leith Docks. *Engineer*, vol. 157, no. 4090, June 1, 1934, pp. 561 and 562. Whole of accommodation at Imperial Dock warehouse is provided by silos; built entirely of reinforced concrete, it is rectangular in plan; consists of a storage section having silos capable of holding 20,000 tons of grain, and a delivery section having delivery silos with a total capacity of 2,500 tons, together with six working floors for distribution, weighing, and delivery of grain.

ROADS AND STREETS. Paving Utah's KSL Highway from Saltair to Airport—First Contract Let Under Public Works Road Program, A. E. Christensen. *Western Construction News*, vol. 9, no. 5, May 1934, pp. 147–149. Contract specifications for 11-mile concrete highway 33 ft wide.

TESTING, SPECIFICATIONS. Proposed Method of Making Compression Tests on Portions of Concrete Beams from Flexure Tests, L. H. Koenitzer. *Am. Soc. Testing Matls.—Advance Paper*, no. 53, mtg., June 25–29, 1934, 8 pp. Results of informal investigation of this method, carried out by the Road Materials Laboratory of the Engineering Experiment Station of Kansas State College, in cooperation with the Kansas Highway Commission.

DAMS

BOULDER DAM PROJECT, HYDRAULIC VALVES. Hydraulic Valves and Gates for Boulder Dam, P. A. Kinzie. *Mech. Eng.*, vol. 56, no. 7, July 1934, pp. 387–408. Design and operation of cylinder gates 32 ft in diameter, and operating mechanism.

CONCRETE GRAVITY, TENNESSEE. Norris Dam Design Modified to Meet New Requirements. *Eng. News-Rec.*, vol. 113, no. 2, July 12, 1934, pp. 44 and 45. Navigation features entirely eliminated, spillway changed as to character and location, and power plant reduced in size; elevation of spillway crest lowered.

EARTH, CALIFORNIA. Bouquet Canyon Dam Built for Los Angeles Aqueduct, H. L. Jacques. *Eng. News-Rec.*, vol. 112, no. 25, June 21, 1934, pp. 810–812. Rolled earth-fill dam, 185 ft high, providing 36,000 acre-ft of intermediate, off-the-line storage to replace that lost with the failure of the St. Francis Dam; reservoir fills and discharges through 3½-mile welded-steel pipe line.

EROSION. Retrogression of Levels in Riverbeds Below Dams, E. W. Lane. *Eng. News-Rec.*, vol. 112, no. 26, June 28, 1934, pp. 836–838. Studies by the U. S. Bureau of Reclamation to determine the possible effect of the phenomena of retrogression of bed levels below dams on the design of the power plant at Boulder Dam; summary of observations in India, California, and Germany.

FLOOD CONTROL, PENNSYLVANIA. Pittsburgh Area Inaugurates Its Flood-Control Program. *Eng. News-Rec.*, vol. 113, no. 2, July 12, 1934, pp. 48–50. Concrete dam, 1,700 ft long, 250 ft in maximum height, on Tygart River, will regulate flow of the Monongahela River and lessen chances of future floods; flood protection for Pittsburgh planned for 26 years; flood control and navigation.

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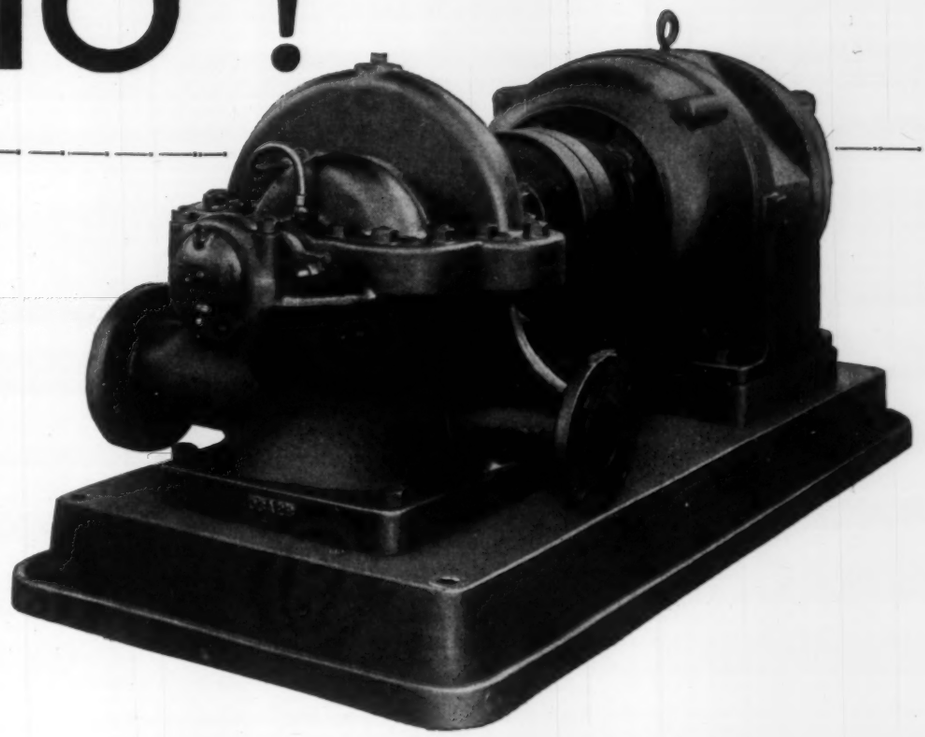

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Fill Dam Materials, H. H. Hatch. *Am. Soc. Testing Matls.—Advance Paper*, no. 91, mtg., June 25–29, 1934, 9 pp. Details concerning research carried out both in laboratory and field, at the Cobble Mountain Reservoir, Springfield Water Works, Westfield, Mass.

RESERVOIRS, LAWS AND LEGISLATION. Reservoirs (Safety Provisions) Act, 1933C, J. C. Coutts. *Instn. Mun. and County Engrs.—Journal*, vol. 60, no. 23, May 8, 1934, pp. 1525–1540, (discussion) 1541–1547. Main provisions of the British act relating to the inspection of reservoirs.

ROCK-FILL, CALIFORNIA. Preliminary Work on World's Largest Rock-Fill Dam, A. G. Darwin. *Western Construction News*, vol. 9, no. 5, May 1934, pp. 159–161. Report of progress on the construction of the San Gabriel Dam, No. 1, the world's largest rock-fill structure, 1,650 ft long on crest, and rising 360 ft above bedrock, with a thickness of 900 ft at the base and 30 ft at the crest; at maximum water surface, elevation is 1,463 ft; reservoir capacity will be 62,000 acre-ft and reservoir area 500 acres.

WEIRS, DISCHARGE. Untersuchungen an ueberfaellen, O. Dillmann. *VDI Zeit*, vol. 78, no. 19, May 12, 1934, pp. 592 and 593. Abstract of original study made at the hydraulic laboratory of the Munich Institute of Technology, on forms of weir nappes, distribution of pressures in nappes, and discharge over weirs.

FLOOD CONTROL

DISCHARGE. Flood Probability Formula Modified to Simplify Application, C. R. Pettis. *Eng. News-Rec.*, vol. 112, no. 25, June 21, 1934, pp. 804 and 805. Method of determining probable 100-year floods based on the width of the drainage area and on rainfall statistics modified to improve the area both practically and theoretically; rainfall index for entire United States developed from run-off records; limits of applicability.

OHIO. Muskingum River Conservation Program Begins in Eastern Ohio, C. C. Chambers. *Eng. News-Rec.*, vol. 112, no. 25, June 21, 1934, pp. 799–801. Design studies started by the U. S. Corps of Engineers on a series of 14 dams, to cost $34,000,000 and store 1,850,000 acre-ft, for flood-control and conservation work totaling $53,000,000 in a district covering 8,100 sq miles; floods on the Ohio River; watershed characteristics; soil-erosion study.

FOUNDATIONS

EARTH BORING MACHINES. Nouveau procéede de forage du sol par benne preneuse. *Genie Civil*, vol. 104, no. 22, June 2, 1934, pp. 496 and 497. Description of portable foundation sounding machine having a clamshell attachment.

EARTH PRESSURE, MEASUREMENT. Accuracy of Goldbeck Cell in Laboratory Tests, W. H. Seaquist. *Eng. News-Rec.*, vol. 112, no 23, June 7, 1934, pp. 730-732. Description of improved Goldbeck cell; test results of pressure cell as determined by precise laboratory methods.

HYDRAULIC ENGINEERING

LABORATORIES, SOVIET RUSSIA. Russia Creates Great Laboratory for Hydraulic Research, I. Gutmann. *Eng. News-Rec.*, vol. 112, no. 24, June 14, 1934, pp. 761–766. Organization and activities of the Scientific Research Institute of Hydrotechnics in Leningrad, U.S.S.R., which is the largest hydraulic institution in the world; features of original apparatus; photographic recording of lines of flow in models by means of luminous floats; testing by method of electro-hydrodynamical analogy; development of original types of overflow rock-fill dams; institute's aid in operation of hydro-electric and irrigation works.

PIPE, STEEL. Stresses in Stiffened Circular Tubes Under External Pressure, R. D. Johnson. *Eng. Journal*, vol. 17, no. 1, Jan. 1934, pp. 18–26. Theoretical mathematical discussion and numerical examples illustrating application of method to case of ribbed 40-in. steel pipe; design of large circular steel tubes subject to external pressure; arrangement of stiffening rings. Before Eng. Inst., Canada.

HYDRO-ELECTRIC POWER PLANTS

PUMPED STORAGE. La station de pompage, pour récupération d'énergie, de Sillre (Suède), G. Willock. *Génie Civil*, vol. 104, no. 21, May 26, 1934, pp. 467–470. Storage of pumped water in three natural lakes, 195 m above the Indal River, to be used in the operation of the Norrfors power plant 250 km downstream; details of pumping plant, steep grade pipe line, over 1 km long, and of tunnel 2 km long.

SOVIET UNION. Hydro-electric Resources of U.S.S.R., B. E. Torpen. *Western Construction News*, vol. 9, no. 5, May 1934, pp. 167 and 168. Tabulation showing proposed 18,000,000-kw installation to be completed by 1942; 65,000,000 kw of known and surveyed water-power sites; and 120,000,000 kw, a potential estimate.

HYDROLOGY, METEOROLOGY, AND SEISMOGRAPHY

RAIN AND RAINFALL, PERIODICITY. Study of Weather Records Fails to Reveal Long-Range Cycles, J. B. Kineer. *Eng. News-Rec.*, vol. 113, no. 2, July 12, 1934, pp. 46–47. Comparisons of records at scattered stations for cycles of 11, 23, and 35 years indicate long-range forecasts would have been wrong about one-half the time. Before Am. Meteorological Soc.

INLAND WATERWAYS

CANAL LOCKS, MODELS. Les essais sur modèles des écluses du canal Albert, A. Braeckman. *Technique des Travaux*, vol. 10, no. 5, May 1934, pp. 290–298. Laboratory tests of 1:30 model of Albert Canal locks, in Belgium, having a length of 136 m and a width of 16 m. (To be continued.)

RIVERS, HYDRAULICS. Model Study of Shoaling Below Starved Rock Lock and Dam, Illinois River. *U. S. Waterways Experiment Station—Paper 13*, Aug. 1933, 19 pp. Price 25 cents. Report on hydraulic model study of the cause of shoaling and the means of preventing it; effect of existing cofferdam; type of permanent construction most suitable to replace present cofferdam; operation of tainter gates; effects of erosion on shoaling; effects of operation of power plant at headgate section on shore lines and shoaling.

IRRIGATION

OVERHEAD. Die Beregnungstechnik im Dienste der deutschen Ernaehrungswirtschaft, G. Schonnopp. *VDI Zeit*, vol. 78, no. 21, May 26, 1934, pp. 637 and 638. Review of German methods and equipment used for overhead irrigation of gardens.

SOUTH AFRICA. Vaal River Development Scheme. *Engineer*, vol. 157, no. 4091, June 8, 1934, pp. 576 and 577. Schemes include the construction of the dam and the diversion weir from which a canal will carry the water through a wide natural channel, in a ridge separating the Vaal River from the Hartz River Valley; history of scheme; design provides for a concrete gravity dam with a maximum height of 120 ft above the river bed.

LAND RECLAMATION AND DRAINAGE

ITALY. Die "Bonifica integrale" Italiens, H. Fluck. *Schweizerische Bauzeitung*, vol. 102, nos. 20 and 21, Nov. 11, 1933, pp. 237–241, and Nov. 18, pp. 253–256. Review of great land reclamation progress of Italy, including reclamation of Pompeian marshes.

MATERIALS TESTING

BUILDINGS, BRICK. Resultant Separation Cracking Between Various Mortars and Brick in Existing Brick Structures, C. C. Connor. *Am. Soc. Testing Matls.—Advance Paper* no. 55, mtg., June 25–29, 1934, 17 pp. Results of study of this type of cracking on 38 existing buildings to determine to what extent it appeared on surface of brickwork where workmanship was good, and whether there was any relationship between the amount of separation cracking and the kinds of material used.

CEMENT TESTING. Cement Investigations for Boulder Dam with Results up to Age of One Year, R. E. Davis, R. W. Carlson, G. E. Troxell, and J. W. Kelly. *Am. Concrete Inst.—Journal*, vol. 5, no. 5, May–June 1934, pp. 485–497. Results of tests, up to age of 1 yr, for heat of hydration and compressive strength of 48 cements of 16 brands; volume-change and durability tests; effect of chemical composition and fineness on strength-heat ratio; durability of mortars; resistance of standard mortar to sodium sulfate and to weather; water requirement.

STRENGTH OF MATERIALS. Toelaatbare spanningen bijmetalen in verband met de materiaaleigenschappen, E. B. Wolff. *Ingenieur*, vol. 49, no. 20, May 18, 1934, pp. Mk 19–27, (discussion) Mk 27–28. Allowable stresses in metals in relation to characteristics of materials; discussion of selection of materials for various uses in relation to properties; results of test samples; microphotographs used as a basis of study.

PORTS AND MARITIME STRUCTURES

TERMINALS. New Cartagena Terminal. *Mar. News*, vol. 21, no. 1, June 1934, pp. 20–22. Details of terminal recently completed by the Frederick Snare Corporation, for the Colombian government; located in the most sheltered part of the Bay of Cartagena, free of tidal currents and rough water; no inflammable materials used; facilities provided for safe navigation of largest ships; total berthing space for ocean ships from 1,200 to 2,528 ft and for fluvial boats from 778 to 2,042 ft; well equipped to handle special and ordinary cargo.

ROADS AND STREETS

BRICK. Strasserklinker und Klinkerstrassen, H. Ehlgoetz. *Tonindustrie-Ztg.*, vol. 58, no. 19, Mar. 5, 1934, pp. 231–235. Paving brick and brick roads; map showing most important deposits of clay for road brick in Germany; brief review of developments in brick-road construction in Germany; advantages of brick pavements.

CONSTRUCTION. Indiana Widens Shoulders on 1,000 Miles of Road. *Eng. News-Rec.*, vol. 112, no. 25, June 21, 1934; pp. 808 and 809. State highway maintenance department carries out a PWA project using day labor; employment reaches peak of 35,000 men; total cost of project $3,000,000.

Penyclip Diversion Scheme, A. B. Taylor *Roads & Road Construction*, vol. 12, no. 138, June 1, 1934, pp. 170–176. Construction of new mountainous macadam road about 35 ft wide, including 7-span concrete-arch viaduct.

DROUGHT EFFECT. Highway Problems Aggravated by Mid West Drought. *Eng. News-Rec.*, vol. 113, no. 1, July 5, 1934, pp. 8–9. Review of conditions in Kansas, Nebraska, and South Dakota; drifting soil and sand have obliterated some roads, and others have suffered from surface erosion; construction work delayed by difficulties in building fills with dry soil.

FRANCE. La 11e Semaine de la Route (Paris, May 28–June 1, 1934), J. Thomas. *Génie Civil*, vol. 104, no. 24, June 16, 1934, pp. 539–542. Proceedings of 2d Highway Meeting "Semaine de la Route" held in Paris, France, during week beginning May 28, 1934, including abstracts of papers on skidding, by Mathieu; road surface corrugations, by C. Masson; bituminous fillers and similar products, J. Bing; liquid asphaltic bitumen, by Linckenheil; progress in concrete road construction, by Turquais; progress in macadam-cement construction, by J. Thomas; use of special cements in road construction, by Kuenemann; metal pavements, by Thevenin; road rolling practice, by Salmson; construction of road rollers, by A. Giard; road lighting and luminous signs, by A. Muzellec; rock crushing, by Bergeaud; and mechanical construction of gravel surfaces, by Rincheval.

GERMANY. Germany Begins Construction of Express Highway System, B. Wehner. *Eng. News-Rec.*, vol. 113, no. 1, July 5, 1934, pp. 10–12. New centralized Federal highway administration plans construction of 7,500 miles of toll roads, restricted to high-speed through travel by automobile, and inaugurates construction on first unit of 3,800 miles; reasons for express roads; plan of administration; design and construction.

GREAT BRITAIN. District Road Work—Lorn District, W. Macdonald. *Inst. Mun. and County Engrs.—Journal*, vol. 60, no. 23, May 8, 1934, pp. 1559–1565 (discussion) 1565–1567. Description of roads in the Lorn District of Argyll, Scotland.

IMPACT. Effect on Slab Stresses of Area of Tire Contact, M. C. Spangler. *Eng. News-Rec.*, vol. 112, no. 26, June 28, 1934, pp. 831 and 832. Area of contact of various tires under different loads determined by tests, and slab stresses computed by Westergaard formulas.

IMPROVEMENT. Road Planting, A. D. C. Le Sueur. *Surveyor*, vol. 85, no. 2207, May 11, 1934, pp. 519 and 520. Initial cost of trees; choice of species for particular purposes; method of staking trees; proper planting depths.

LIGHTING. Need for Adequate Highway Lighting, F. T. Groome. *Can. Engr.*, vol. 66, no. 22, May 29, 1934, pp. 23–25. Accidents caused by collisions at night, which could be avoided if highways were illuminated. Before Illuminating Eng. Soc., Toronto.

SLAG. Dirt Streets Surfaced with Slag as Unemployment-Relief Measure. *Eng. News-Rec.*, vol. 113, no. 1, July 5, 1934, pp. 3–4. Method of surfacing over 50 miles of dirt streets in Pittsburgh, Pa., giving employment to 3,000 men.

SURFACE TREATMENT, BITUMINOUS. Stabilized Soil-Bound Road Surfaces. III—Construction and Maintenance, W. R. Collings and L. C. Stewart. *Eng. News-Rec.*, vol. 112, no. 24, June 14, 1934, pp. 772–775. Accepted practice in constructing and maintaining stabilized soil roads summarized in the light of tests and practical experience; preparatory procedure; pulverizing and mixing binder; shaping and compacting; reconditioning old roads; maintenance of stabilized wearing courses.

TESTING. Laboratory Service Test for Pavement Materials, A. T. Goldbeck, J. E. Gray, and L. L. Ludlow, Jr. *Am. Soc. Testing Matls.—Advance Paper*, no. 82, mtg., June 25–29, 1934, 19 pp. Service test that may be made conveniently and under controlled conditions of temperature, moisture, subgrade, and traffic; apparatus consists of circular track with diameter of 14 ft, in which pavement sections are laid and subjected either to action of roller or to pneumatic-tired wheel, which may be equipped with tire chains; tests described to indicate usefulness of testing device.

SEWERAGE AND SEWAGE DISPOSAL

CHLORINATION. Value of Chlorine in Sewage Disposal—I. *Water and Water Eng.*, vol. 36, no. 431, Mar. 31, 1934, pp. 156–158. Some troubles cured and prevented by chlorine treatment.

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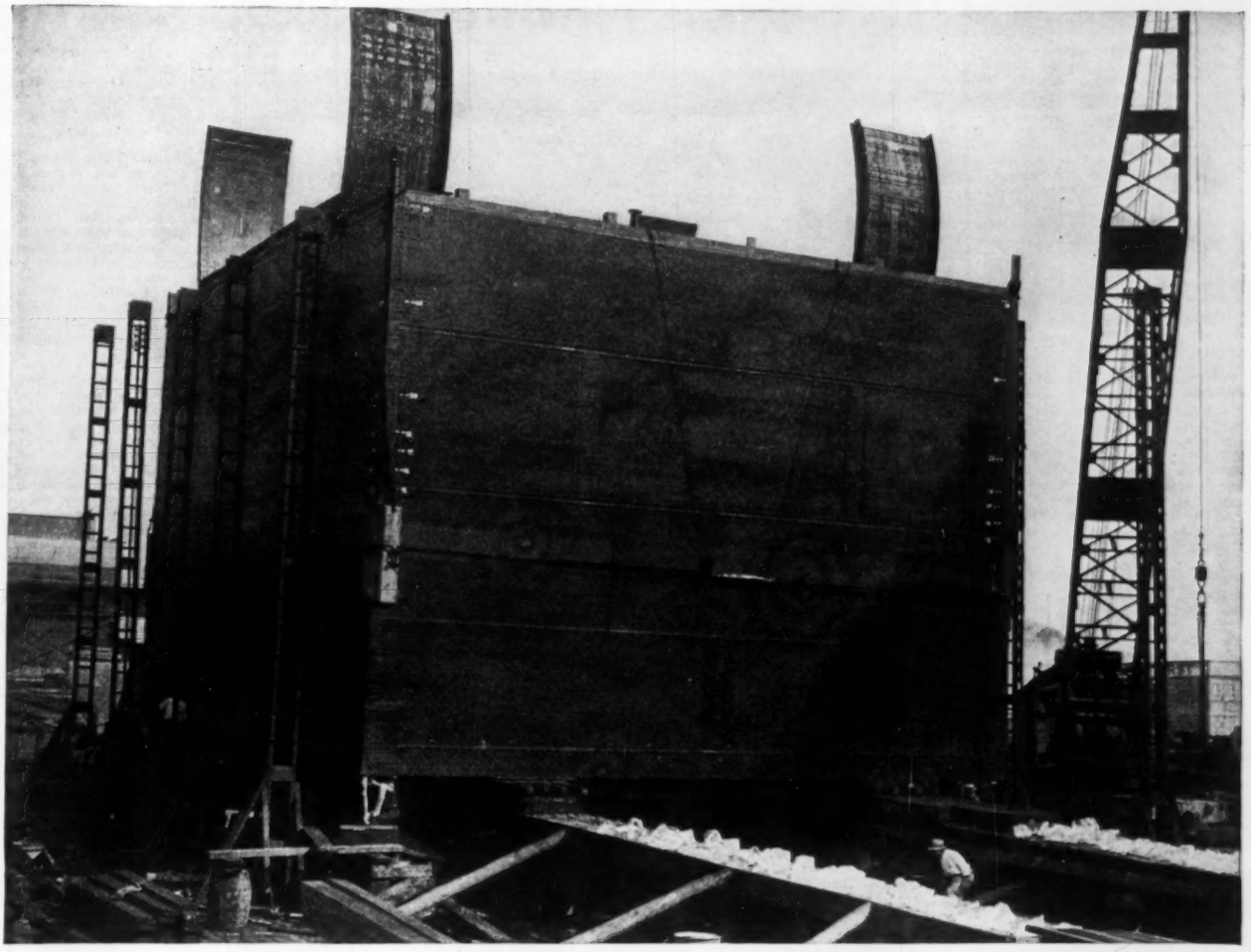

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DISPOSAL PLANTS, DECATUR, ILL. Operation of Sewage Treatment Plant of Decatur Sanitary District, 1928–1933. W. D. Hatfield. *Sewage Works Journal*, vol. 6, no. 3, May 1934, pp. 489–503. Superintendent's report on new construction; plant operation; removal of screenings and grit; sprinkling filter operation; secondary tank operation; population equivalent and plant efficiencies; population equivalent balance.

DISPOSAL PLANTS, OPERATION. Sewage-Plant Survey—V. Data from Lima, Ohio. *Eng. News-Rec.*, vol. 112, no. 25, June 21, 1934, p. 813. Performance data of sewage disposal plant of Lima, Ohio, capable of serving a population of 70,000.

FLOW METERS. Measurements of Sewage. W. G. ARDLEY. *Surveyor*, vol. 85, no. 2207, May 11, 1934, p. 512. Use of weirs prior to 1896; first sewage meter constructed in Great Britain in 1898; large-scale measurement at Sheffield in 1911.

GREAT BRITAIN. Leek's New Main Outfall Sewers and Sewage Disposal Works. *Surveyor*, vol. 85, no. 2207, May 11, 1934, pp. 521 and 522. Plant consisting of two detritus tanks, three sedimentation tanks, ten filters, two humus tanks, storm-water tanks, and sludge-drying beds.

ODOR CONTROL. Chemical Precipitation in Sewage Treatment. A. Potter. *Can. Engr.*, vol. 66, no. 21, May 22, 1934, pp. 18–19. Elimination of offensive conditions and odor nuisance; conclusions based on operation of disposal plant at Atlanta, Ga.

SCREENS. Das Zentri-Sieb, W. Seegert. *Gesundheits-Ingenieur*, vol. 57, no. 6, Feb. 10, 1934, pp. 68–70. Details of centrifugal screen, particularly useful in an emergency outlet, as it enables the plant operator in times of high flow after heavy rains, to deliver a large percentage of sewage solids to plant, while more dilute partially purified fraction is by-passed; screen is self-cleaning, since any deposit would be dislodged by centrifugal force.

SLUDGE. Drying and Incineration of Sewage Sludge, A. E. Stilson. *Pub. Works*, vol. 65, nos. 5 and 6, May 1934, pp. 14–16, and June, pp. 53–54. May: Dewatering to concentrated filter cake; drying of cake to prepare sludge for mechanical firing; complete combustion of material. June: Incineration and design of incinerators.

STRUCTURAL ENGINEERING

CONCRETE SLABS, DESIGN. Two-Way Slabs in Proposed Building Code for Boston and New England. J. R. Nichols. *Am. Concrete Inst.—Journal*, vol. 5, no. 5, May–June 1934, pp. 504–509. Specifications for methods of design of 2-way slabs; factors affecting relative bending in two directions.

JOINTS. Hinges and Pivots for Covers and Flexible Joints—I, H. J. Martin. *Product Eng.*, vol. 5, no. 6, June 1934, pp. 230 and 231. Illustrations of 30 types.

MODELS. Models as Aids in Design and Construction. *Eng. News-Rec.*, vol. 112, no. 26, June 28, 1934, pp. 843–846. Proceedings of conference on laboratory uses of models in structures and hydraulics, held in connection with annual meeting of the Society for the Promotion of Engineering Education; deformeter method; photo-elastic methods; new photo-elastic developments; classification of models; suspension bridge models; dam studies; soap-film analogy; hydraulic models.

RESEARCH. Ohio State's Engineering Experiment Station—II, J. M. Weed. *Eng. News-Rec.*, vol. 112, no. 21, May 24, 1934, pp. 666–668. Review of research in subsoils, concrete, masonry, tall building frames, etc.

SLABS, DESIGN. Calcul de certains types de dalles circulaires, G. Prudon. *Technique des Travaux*, vol. 10, no. 5, May 1934, pp. 313–317. Theoretical mathematical analysis of stresses in various types of circular slabs.

STATICALLY INDETERMINATE STRUCTURES, DESIGN. Application of Hardy Cross Method of Moment Distribution, H. A. Williams. *Am. Soc. Mech. Engrs.—Trans.*, vol. 56, no. 5, May 1934, pp. 305–319 (AER-56-9). Principles of method of analyzing continuous frames by distributing fixed-end moments; illustrations of application of method to various types of structures, including elevator spar with supports on line, same spar with deflected supports, and airplane fuselage truss with loads between panel points. See also Engineering Index, 1930, p. 1647.

Berechnung mehrstoeckiger kontinuierlicher Rahmen durch die Methode der algebraischen Momentenverteilung, M. F. Fornerod. *Schweizerische Bauzeitung*, vol. 102, no. 19, Nov. 4, 1933, pp. 223–228. Outline of Hardy Cross's method of moments for design of statically indeterminate, continuous multi-story frames.

TUNNELS

VEHICULAR, ELECTRIC POWER. Mersey Tunnel Cable Installation. *Elec. Times*, vol. 85, no. 2223, May 31, 1934, pp. 723 and 724. Particulars of 33-kv grid interconnector between Birkenhead and Clarence Dock.

WATER SUPPLY. Preston Aqueduct Tunnels, E. C. Oakes. *Surveyor*, vol. 85, no. 2209, May 25, 1934, pp. 563–565. Construction operation and cost of gravitation tunnel 1,000 yd in length, connecting the Langden Valley intake works with the storage reservoirs near Longridge. Before Inst. Water Engrs.

WATER PUMPING PLANTS

DIESEL. New Swindon Water Works. *Engineer*, vol. 157, no. 4091, June 8, 1934, p. 587; see also *Engineering*, vol. 137, no. 3569, June 8, 1934, pp. 647–648, and supp. plates. Works, known as Latton water scheme; two units installed, one to act as stand-by; each of these sets comprises Ruston and Hornsby oil engine coupled with a Gwynne, two-stage centrifugal pump through David Brown gearing; capable of pumping from 110,000 to 112,000 gal per hr against a total head of 300 ft.

WATER TREATMENT

BACTERIOLOGY. Removal of Bacterial Flora from Water in Settling Basins by Added Clay Dispersions, E. M. Slocum. *Am. Water Works Assn.—Journal*, vol. 26, no. 5, May 1934, pp. 645–651, (discussion) 651 and 652. Use of adsorptive complexes between aluminum compounds and clays for removal of colloidal industrial wastes; use of bleaching clay for the prevention and elimination of bacterial troubles, including disagreeable taste and odors.

CHLORINATION, AMMONIA-CHLORINE. Water Sterilization by Chloramine. *Water and Water Eng.*, vol. 36, no. 431, Mar. 31, 1934, pp. 163–165. Explanation of ammonia-chlorine process for potable and swimming pool water.

FILTRATION, ALUMINUM COAGULANTS. Correct Use of Aluminum Coagulants in Filter Plant Practice. *Water and Water Eng.*, vol. 36, no. 431, Mar. 31, 1934, pp. 177–180. Disadvantages of using aluminum sulfate; advantages of double coagulation using a floc sodium aluminate and alum.

FILTRATION PLANTS, ONTARIO. Filter Sand Experiments at Toronto Island Filtration Plant—II, L. F. Allan. *Can. Engr.*, vol. 66, no. 21, May 22, 1934, pp. 9–14. Apparatus and experiments with small glass filters and results obtained. Before Am. Water Works Assn.

ISLE OF WIGHT. Sandown Water Works. *Water and Water Eng.*, vol. 36, no. 431, Mar. 31, 1934, pp. 158–162. Characteristics of representative samples of untreated and treated water; system of treatment and equipment of purification plant.

MAINTENANCE AND REPAIR. New Surfaces for Old. *Eng. & Contract. Rec.*, vol. 48, no. 19, May 9, 1934, pp. 379–382. Practical methods for resurfacing worn-out pavements with concrete.

MUNICIPAL SUPPLY. Accomplishments and Objectives of Municipal Water Supply, N. J. Howard. *Can. Engr.*, vol. 66, no. 21, May 22, 1934, pp. 15–17. Developments in methods of water purification; elimination of tastes and odors; marked decline in typhoid fever; clarification of turbid waters.

SOFTENING, ZEOLITE PROCESS. Progress in Municipal Water Softening by Zeolites, A. S. Behrman. *Water Works and Sewerage*, vol. 81, no. 5, May 1934, p. 153. Advantages and economy of process; factors to consider in making installation.

TREATMENT. Water Purification, E. S. Hopkins. *Mun. Sanitation*, vol. 5, no. 3, Mar. 1934, pp. 85–90. Fundamental principles of purification; purposes are to provide safe supply, free of disease germs, dirt, color, taste, or odor; corrective treatment to minimize household and industrial troubles. Bibliography. Before Am. Chem. Soc.

TREATMENT, HYDROGEN-ION CONCENTRATION. Phosphoric Acid in pH Control. R. C. Higgins. *Water Works Eng.*, vol. 87, no. 8, Apr. 18, 1934, pp. 360–363. Use of phosphoric acid as method of reducing pH of water by Board of Public Works, Chillicothe, Mo.; probable chemical reactions; average chemical treatment and results obtained; advantages and disadvantages.

TREATMENT, TASTE AND ODOR REMOVAL. Latest Procedures in Use of Activated Carbon for Taste and Odor Control, F. E. Stuart. *Pub. Works*, vol. 65, no. 6, June 1934, pp. 35 and 36. Procedures for emergency treatment, preparing plant for routine control and routine treatment.

TREATMENT, UNITED STATES. Pollution, Turbidity, and Hardness in Mid-West Waters, N. T. Veatch, Jr. *Eng. News-Rec.*, vol. 112, no. 22, May 31, 1934, pp. 707–708. Sources of Mid-Western water supplies; monthly average turbidity, hardness, bacterial count, and B-coli index of Kansas River water at Topeka for 1931 and 1932; variability hampers treatment; range in total hardness of ground-water supplies in several Mid-Western states.

WATER WORKS ENGINEERING

CONSTRUCTION. Building New Water Supply Under PWA Auspices, F. Gannett. *Eng. News-Rec.*, vol. 112, no. 22, May 31, 1934, pp. 690–692. Historical account of difficulties overcome in carrying through to completion force-account construction of 11-mi pipe line to bring water to Shippensburg, Pa.; a first PWA project in that state.

DESIGN. Notes on Small Water Supply Schemes. *Concrete & Constr. Eng.*, vol. 29, no. 5, May 1934, pp. 339–344. Cost of service reservoirs; square versus circular reservoirs; roof design; design of flat-slab roofs; roof panels reinforced in two directions; columns; walls; floors; water towers; costs; capacity and shape of tank.

FINANCING. Water Works Financing, G. P. Gordon. *Am. Water Works Assn.—Journal*, vol. 26, no. 4, Apr. 1934, pp. 516–523. Financing new work; serial or sinking fund bonds; rate structure.

NEW YORK CITY. More Water Urgently Needed by New York City, W. E. Spear. *Eng. News-Rec.*, vol. 112, no. 22, May 31, 1934, pp. 698–702. Under best conditions city will be at limit of its water supply by 1940 unless Delaware River water is then available; relation of consumption to supply in 1930; proposed new sources of supply for New York; water consumption in New York City since 1868; elimination of waste and leakage; conditions affecting success of meters in reducing waste of water.

OPERATION. Improving Water Service During Depression. *Eng. News-Rec.*, vol. 112, no. 22, May 31, 1934, pp. 684–689. Symposium including: New York Reduces Waste by Stopping Underground Leaks, W. W. Brush; General Improvements Made in Many Water Systems, Water-Distribution System Strengthened at Pittsburgh; Plant Capacity Raised by Bettering Operation, M. C. Smith; Relief Labor Utilized to Recondition Water System, S. M. Van Loan.

OWENTON, KY. Design of Small Water Works Plant at Owenton, Ky., C. N. Harrub. *Pub. Works*, vol. 65, no. 4, Apr. 1934, pp. 13–14. Plant described consists of earth dam and impounding reservoir, filtration plant, force main from plant to town, distribution system, and elevated storage tank.

RATE MAKING. Rational Rate Structures for Municipal Water Works, A. W. Consoer. *Eng. News-Rec.*, vol. 112, no. 22, May 31, 1934, pp. 715–717. Bases for equitable rates reexamined in light of requirements for making revenue bonds eligible to receive PWA consideration; rational determination of relative shares to be borne by individual consumer and by community at large; effects of PWA standards; hydrant charges; consumption charges.

TANKS. Milwaukee's Six-Million-Gallon Welded Tank. *Boiler Maker & Plate Fabricator*, vol. 34, no. 4, Apr. 1934, pp. 109–110. Construction of all-welded 6,000,000-gal steel water tank completed by City of Milwaukee, augmenting storage and increasing supply in Menomenee Valley in western part of city; tank is of flat-bottom type and is said to be largest welded tank yet built; it is 165 ft in diameter, 37½ ft high to overflow line, and covered with 3/16-in. roof plates; total weight 700 tons; dimensional drawings.

TOWERS. Designing Elevated Water Tanks, C. R. Young. *Pub. Works*, vol. 65, no. 6, June 1934, pp. 16 and 17. Determination of capacity, height, location, and type of tank.

UNITED STATES. Meeting of Southeastern Section of A.W.W.A. *Water Works & Sewerage*, vol. 81, no. 5, May 1934, pp. 155–157. Abstracts of papers presented at 1934 annual meeting: Reconstruction of Riverside Station at Macon, Ga., T. E. P. Woodward; Handling and Storage of Water Works Chemicals, L. L. Hedgepeth; Open vs. Closed Reservoirs, F. W. Chapman; Improved Designs and Painting of Elevated Tanks, J. M. Perryman; Underground Corrosion in Southeastern States, K. H. Logan; Flow of Small Streams, B. M. Hall, Jr.

WELLS, PUMPS. Pumps for Deep Farm Wells. *Engineer*, vol. 157, no. 4093, June 22, 1934, p. 638. It is claimed that a promising method of deep-well working is the injection system which requires no working parts whatever below ground level and is available at a very low cost; this system makes use of an ordinary shallow well pump on the ground running in conjunction with two sets of pipes into the well and a special injector device in the water.

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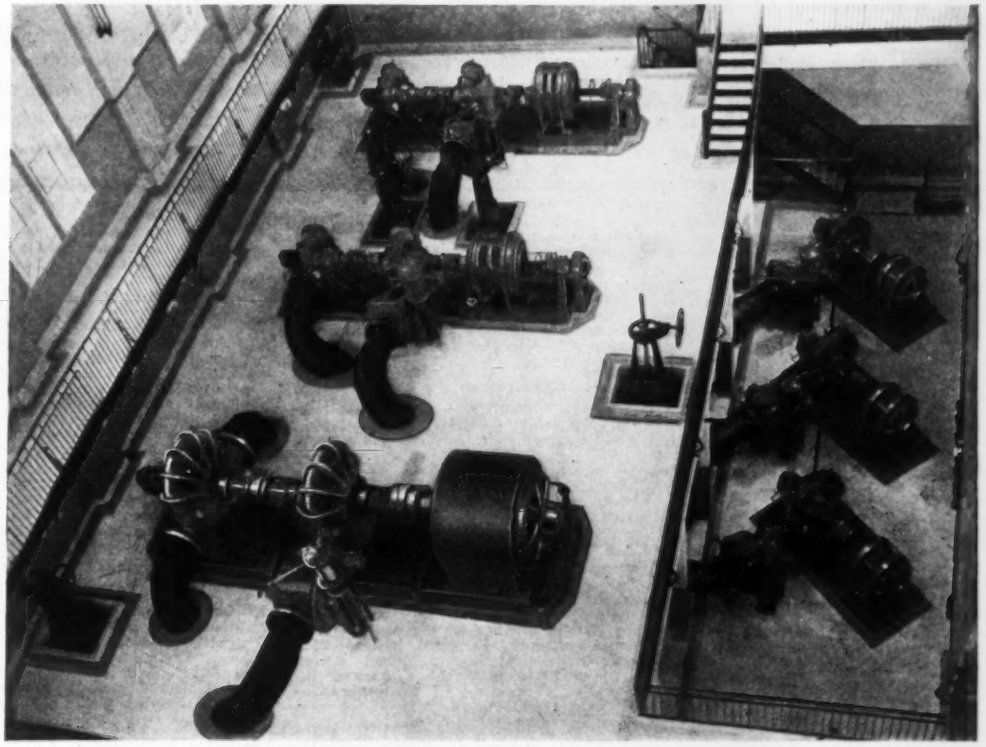

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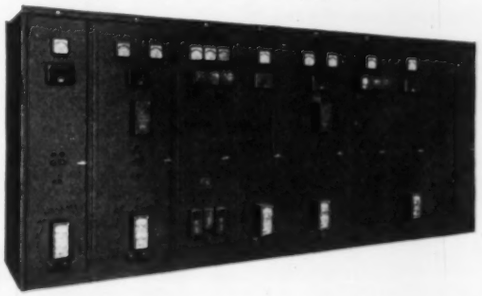

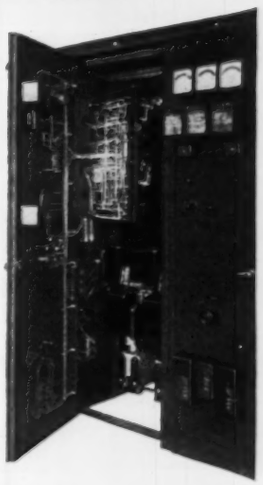

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BRIDGES

CHINA. Presidential Address, A. F. Gimson. *Eng. Soc. China—Proc.*, vols. 30 and 31, 1931–1933, pp. 19–24, 3 supp. sheets. Brief general account of bridges in Shanghai.

CONCRETE ARCH, FRANCE. Le nouveau pont en béton de ciment fondu pervibré, sur la Loire à Saint-Thibault (Cher), H. Souillot. *Génie Civil*, vol. 104, no. 25, June 23, 1934, pp. 556–560, supp. plate. Design and construction of a new concrete arch highway bridge over the Loire River at Saint-Thibault, France, having a total length of 398 m, including five 64-m. arch spans; vibrated high-strength concrete used; details of wind bracing, reinforcement, etc.

DESIGN, UNITED STATES. Evolution of Early American Bridges, L. N. Edwards. *Newcomen Soc.—Trans. 1932–1933*, vol. 13, 1934, pp. 95–114, (discussion) 114–116. Development of transportation; pioneer wooden bridges; pile and frame trestle bridges; arch and truss bridges; metal bridges; wrought-iron suspension bridges; cast-iron arch and truss bridges.

FLOORS. Aluminum Floor for Old Bridge. *Engineer*, vol. 158, no. 4098, July 27, 1934, pp. 93–95 and 90; see also editorial comment, p. 91. New floor system installed in Smithfield Street Bridge in Pittsburgh.

HIGHWAY, DESIGN. Bending-Moment Determination in Highway Bridge Slabs, R. B. B. Moorman. *Eng. News-Rec.*, vol. 113, no. 3, July 19, 1934, p. 82. Simplified method of determining live-load bending moments in highway-bridge slabs of certain limiting span lengths.

RAILROAD CROSSINGS. Railroad Grade-Crossing Structures to Meet Every Requirement. *Eng. News-Rec.*, vol. 113, no. 3, July 19, 1934, pp. 65–70. Canadian National Railways designs in concrete and in steel and concrete, incorporating precast slabs, ballastless decks, concrete ties, timber cushion blocks, and long-span rigid frames.

SUSPENSION, CABLES. Main Cables and Suspenders for Suspension Bridges, C. D. Meals. *Eng. Journal*, vol. 17, no. 8, Aug. 1934, pp. 358–363. Useful data, specifications, and information based on recent practice as to the physical properties of steel wire for bridges; various types of main cable, their characteristics, and results of tests; particulars regarding suspender ropes and end fastenings for wire ropes. Before Eng. Inst. Canada.

SUSPENSION, MODELS. Model Tests for San Francisco–Oakland Bridge, G. E. Beggs, R. E. Davis, and H. E. Davis. *Engineering*, vol. 138, no. 3573, July 6, 1934, pp. 4–6. Previously indexed from Univ. Calif.—Publ. in Engineering, vol. 3, no. 2, 1933.

WOODEN. Historic Bridge Saved by Metal Crib Wall, C. Ferguson. *Eng. News-Rec.*, vol. 113, no. 4, July 26, 1934, p. 111. Retaining wall of standard units installed during winter months to protect pier of 220-ft span wooden bridge near Eugene, Ind.

BUILDINGS

AIR CONDITIONING. Air Conditioning System of New Metropolitan Building—First Summer's Experience, W. J. McConnell and I. B. Kagey. *Heating, Piping & Air Conditioning*, vol. 6, no. 6, June 1934, pp. 274–278. Air conditioning system of 28-story building of Metropolitan Life Insurance Company, New York City, with floor area of 23 acres and capacity of 15,000,000 cu ft, completely air conditioned; record of floor temperature and humidity; typical duct layout; diagrammatic sketch of air-conditioning plant. Before Am. Soc. Heating and Vent. Engrs.

Largest Freon Refrigerating Plant Air-Conditions New Post Office, R. N. Ward. *Power*, vol. 78, no. 7, July 1934, pp. 392–394. New structure, air-conditioned throughout, occupies ground area of 261,000 sq ft; eight stories high and has total volume of 14,000,000 cuft; three compressors, totaling 1,500-ton capacity, cool building; liquid refrigerant is sprayed into water coolers by liquid pumps.

EXHIBITIONS, CHICAGO. 1934 Century of Progress Exposition. *Power Plant Eng.*, vol. 38, no. 6, June 1934, pp. 280–285. General discussion of various features at exhibition, such as, scientific theater, electrical building, new Ford building, new foreign villages, 670-ft electric fountain, etc.

CITY AND REGIONAL PLANNING

FRANCE. Le premier Congrès d'Urbanisme (Bordeaux, 1er-5 juin, 1934), S. G. Zipper. *Génie Civil*, vol. 105, no. 3, July 21, 1934, pp. 63–65. Proceedings of the first City Planning Congress held in Bordeaux, France, during June 1934; abstracts and discussions on problems of small towns and villages, management of arterial traffic, etc.

CONCRETE

CONSTRUCTION. Great Britain. Department of Scientific and Industrial Research. Report of Reinforced Concrete Structures Committee of the Building Research Board with Recommendations for Code of Practice for Use of Reinforced Concrete in Buildings. London, His Majesty's Stationery Office, 1933. 69 pp., diagrs., tables, 1s 3d (Obtainable from British Library of Information, New York, 41 cents.) Code of practice intended to be guide in presentation of local building codes. Eng. Soc. Lib. N.Y.

CONSTRUCTION, VIBRATING. Beton-Vibration. *Tonindustrie-Ztg.*, vol. 58, no. 27/28, Apr. 5, 1934, pp. 338–340. Vibrated concrete based on results obtained from questionnaire sent to French concrete manufacturers and technologists; brief outline of experiences in this field is given.

DISINTEGRATION. Les ciments inattaquables par les eaux tres pures, P. Dumolard. *Génie Civil*, vol. 104, no. 26, June 30, 1934, pp. 584–586. Corrosion of cement mortar and concrete by distilled and naturally pure water; effect of water on silicates and aluminates of calcium; hydrolysis of calcium compounds; methods of preventing corrosion of cement by chemically pure water.

MIXING. Basic Steps in Control of Concrete, J. C. Sprague. *Concrete*, vol. 42, no. 5, May 1934, pp. 17–19. Inter-relationship between mass, unit weights, specific gravity, density, apparent specific gravity, voids, and concrete density.

RESEARCH. Reinforced Concrete Laboratory of Tunnel Portland Cement Co., Ltd. *Engineering*, vol. 138, no. 3575, July 20, 1934, pp. 62–63 and supp. plates. Physical and chemical laboratory erected at works in West Thurrock, Essex, is built entirely of reinforced concrete; this material has also been used for every possible part of equipment, including shelves, cupboards, and even desks.

SLABS, TESTING. Esperienze su grandi lastre, C. F. Camoletto. *Ingegnere*, vol. 8, no. 13, July 1, 1934, pp. 650–659. Mathematical analysis of results of tests of series of reinforced concrete slabs, 5.6 m by 6.4 m in area, forming parts of ramp and highway platforms of Rome-Turin Highway, Italy.

TESTING, PHOTO-ELASTIC. Le photo-élasticimètre Mabboux, et son emploi pour l'étude des ouvrages en béton. *Génie Civil*, vol. 104, no. 25, June 23, 1934, pp. 566–567. Description of Mabboux photo-elastometer and its use in the measurement of stresses in concrete members.

DAMS

BOULDER DAM. Boulder Dam Construction, M. M. O'Shaughnessy. *Water Works Eng.*, vol. 87, no. 12, June 13, 1934, pp. 654–657. Report of views of visiting water-works engineer.

BOULDER DAM, HYDRAULIC GATES. Radial Gates, Gate Hoists, High Pressure Gates, and Outlet Pipes for Spillway and Outlet Works at Hyrum Dam, Hyrum Project, Utah. *U. S. Bur. Reclamation—Specifications*, n 586, 1934, 23 pp., 26 supp. sheets. Schedule, specifications, and drawings for three 16-ft by 12-ft radial gates; three motor-driven, double-drum, radial gate hoists; four 2-ft 9-in. by 2-ft 9-in. high pressure gates, together with hydraulic hoists, gate hangers, automatic air valves, and conduit linings; and two plate steel outlet pipes for installation in spillway and outlet works.

BOULDER DAM, REFRIGERATION. Cooling Concrete at Boulder Dam, H. N. Royden and A. G. Roach. *Refrig. Eng.*, vol. 28, no. 1, July 1934, pp. 11–13 and 45. Capacity of refrigerating plant is 1,000 tons, circulating cold water in 660 miles of 1-in. pipe; plant consists of three duplex Ingersoll-Rand single-stage compressors having a 10-in. bore by 14-in. stroke and operating at 257 rpm; 250-hp electric motors drive compressors.

BOULDER DAM, STEEL CASTINGS. Steel Castings for Boulder Dam, P. Dwyer. *Foundry*, vol. 62, no. 6, June 1934, pp. 14–17 and 42. High degree of foundry skill and technique involved in the production of unusual castings.

CONCRETE ARCH, SPECIFICATIONS. Parker Dam and Appurtenant Works. *U.S. Bur. Reclamation—Specifications*, no. 574, 1934, 76 pp., 39 supp. sheets. Schedules, specifications, and drawings for construction of overflow concrete-arch dam, 265 ft maximum height, over 900 ft long, including Stoney gates and other appurtenant structures, such as two concrete-lined tunnels, 29 ft high, about ½ mile long each, for Parker Dam project, California–Arizona.

DESIGN. Design of Non-Overflow Dams, N. I. Anissimov. Moscow, Transportation Department of State Publishing Office, 1934, 233 pp., figs., diagrs., charts, tables. Geological investigation of dam sites, including geophysical methods of exploration; artificial methods of improvement of dam foundations; principles of design of non-overflow earth and rockfill dams, including hydraulic-fill and peat dams; design of spillways; design of concrete dams, including single arch, multiple arch, counterfort, and slab dams (in Russian).

HYDRAULIC GATES. Drosselklappen als Grundablassverschluesse unter besonderer Berueecksichtigung der Kavitationsgefahr, O. Juengling. Munich and Berlin, R. Oldenbourg, 1934, 51 pp., illus., diagrs., charts, tables, 4.50 rm. Report is concerned with the re-design of butterfly valve so that cavitation will be avoided and valve made suitable as discharge valve for dams; danger of cavitation and its relation to design; data and results from recent installations. Eng. Soc. Lib. N.Y.

FLOOD CONTROL

LEVEE CONSTRUCTION. Lake Okeechobee Storm Tides Confined by 66-Mile Levee, S. T. Henry. *Eng. News-Rec.*, vol. 113, no. 7, Aug. 16, 1934, pp. 195–200. Combination navigation and flood-control project being carried out by the U. S. government to prevent a repetition of the disastrous overflows of 1926 and 1928, calling for over 43,000,000 cu yd of rock and levee and auxiliary structures to control lake levels; flood-control plans; wet and dry borrowpit methods; hydraulic-fill levee; progress and personnel.

FLOW OF FLUIDS

OPEN CHANNELS. Streamline and Turbulent Flow in Open Channels, J. Allen. *Lond., Edinburgh, & Dublin Philosophical Mag. & Journal Science*, vol. 17, no. 116, June 1934, pp. 1081–1112. Report on University of Manchester laboratory study of flow of water in flume, 16.8 ft long and 3.15 to 6 in. wide, with smooth and roughened side-walls and bottom; critical velocity with simple convergent approach channel; examination of flow by means of color bands; critical velocity with eddy formation in approach channel; equation of laminar flow; turbulent flow; similarity of channels.

PIPES. Water Flow in Pipe-Line, C. M. Allen. *Mech. World*, vol. 96, no. 2479, July 6, 1934, pp. 12–13. Before Am. Soc. Mech. Engrs., previously indexed from *Mech. Eng.*, Feb. 1934.

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SEWERS. Die Fliesseigenschaften von Abwasserschlamm, W. Merkel. *Beihefte zum Gesundheits-Ingenieur*, series 2, no. 14, 1934, 27 pp. Experimental and theoretical study of the flow of sewage and of plastic materials, largely based on more general work, by Bingham, Ostwald, and Reiner; effect of pipe friction, temperature, and constituents of sewage sludge; pumping curves for sewage and other sludges, paper pulp, concrete, and other materials.

WEIRS, RECTANGULAR. Experiments on Small Rectangular Weir Without Side Contractions, Y. Shimoyama. *Soc. Mech. Engrs., Japan—Journal*, vol. 37, no. 205, May 1934, pp. 263–267. Details of suppressed weir used in hydraulic laboratory of Kyushu Imperial University; one cause of sudden variation of discharge coefficient is relative displacement between crest of weir and scale of hook gage; Rohbock's formula shows better coincidence with suppressed weir having low crest of 30.25, 20.02, and 10.00 cm than other formulas. (In Japanese, with English abstract p. S-31-2.)

FOUNDATIONS

BRIDGE PIERS, CONSTRUCTION. Substructure of Reconstructed Second Narrows Bridge, P. L. Pratley. *Eng. Journal*, vol. 17, no. 8, Aug. 1934, pp. 343–357. Construction of concrete piers for new lift bridge, with maximum span of 286 ft, over the Second Narrows of Vancouver Harbor after its wreck in 1930; events leading to selection of new design; two new piers were put in by caisson work carried out in strong tidal currents, and one existing pier was demolished. Before Eng. Inst. of Canada.

SOILS, DEFORMATION. Ueber die Anwendung bodenkundlicher Gesichtspunkte bei der Beurteilung zum Fliessen neigender Tone, K. Utescher. *Zeit fuer praktische Geologie*, vol. 42, no. 4, Apr. 1934, pp. 57–62. Applications of studies of soil to estimation of clays having tendency to flow; it is claimed that in the study of this problem, which may be of interest to geologist, physicist, or engineer, a number of chemical aspects have a direct bearing and must be taken into consideration. Bibliography.

TESTING. Modern Methods of Clay Analyses, Forecasting Settlements of Structures, and Allied Problems, G. Tschebotareff. *Structural Engr.*, vol. 12 (new series), no. 8, Aug. 1934, pp. 350–360. Settlement components; extraction of undisturbed samples from boreholes; determination of value and rate of settlement component of structure, due to vertical consolidation; distribution of pressures in soil; mathematical treatment of time-settlement curves; simplified laboratory tests; stresses in superstructure due to settlements.

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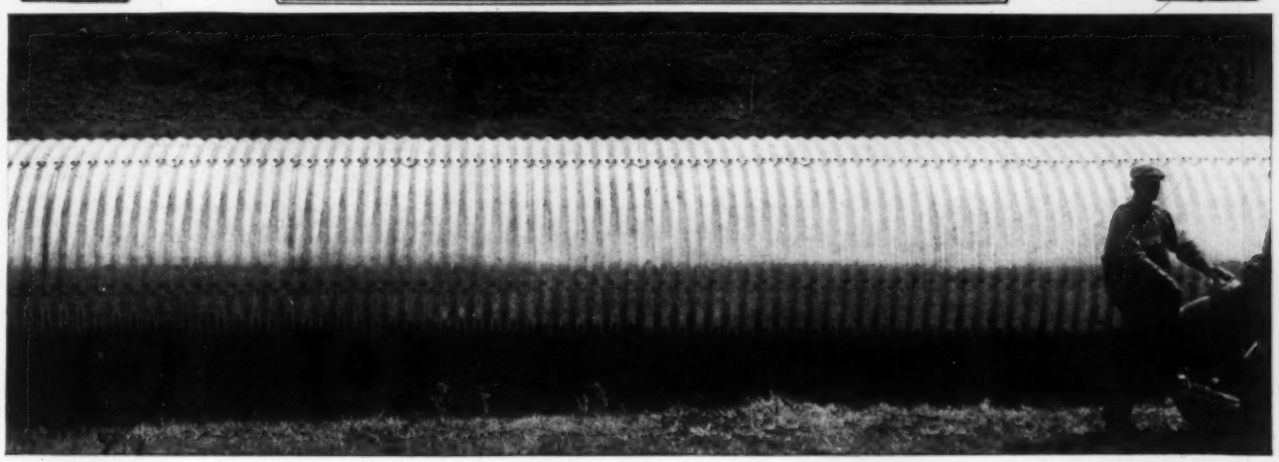

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Sulfur in Sewage, W. S. Mahlie. *Sewage Works Journal*, vol. 6, no. 3, May 1934, pp. 347–379. Origin and forms of sulfur in sewage; bacteria causing changes in sulfur compounds; formation of hydrogen sulfide in sewers, Imhoff tanks, septic tanks, sprinkling filters, and digestion tanks; control and toxicity of hydrogen sulfide in sewage and water; Buswell and Elder modification of Almy's method; determination of total sulfur in sewage and sludge; sulfide determination. Bibliography.

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FLUMES. Ten-Foot Parshall Measuring Flume at Providence, C. G. Richardson. *New England Water Works Assn.—Journal*, vol. 48, no. 1, Mar. 1934, pp. 1–5. Description of flume installed at Providence sewage disposal plant at Fields Point; agreement between measurements of sewage with this flume and with 10-ft standard weir is within one-quarter of 1 per cent.

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TUNNELS

AIR-FLOW METERS. Air-Flow Meters for Mersey Tunnel. *Engineering*, vol. 138, no. 3574, July 13, 1934, p. 37. Maximum delivery of fresh air to tunnel is 2,500,000 cu ft per min, and this air is measured at each of 10 points in intake shafts and at each of 6 points in exhaust shafts; measuring apparatus required was constructed by G. Kent, Ltd., and comprises air-flow meters, indicators, and recorders; meters are of impact-plate type.

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SUPPLY TUNNELS, SPRINGFIELD, MASS. Cobble Mountain Power Tunnel, H. H. Hatch. *New England Water Works Assn.—Journal*, vol. 48, no. 2, June 1934, pp. 123–146. Design and construction of concrete-lined power tunnel of combined water supply and water power project of Springfield, Mass.; tunnel is over 8,000 ft long, and two-thirds of it is of horseshoe section 10 ft by 9 ft 4 in.; rest is of circular shape 10 ft in diameter; control of tunnel lines and grades; shaft and tunnel excavation; concrete; tunnel pantograph; grouting; cost data.

VANCOUVER. First Narrows Pressure Tunnel, Vancouver, B.C., W. H. Powell. *Eng. Journal*, vol. 17, no. 6, June 1934, pp. 253–266. Construction of tunnel carrying water supply of city under entrance to Vancouver Harbor, 3,100 ft long, lined with steel-cylinder reinforced concrete piping, having clear waterway 7 ft 6 in. in diameter; vertical shafts on north and south shores are nearly 400 ft deep, and are similarly lined; cost and progress figures given.

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WATER TREATMENT

ANALYSIS. Photo-discoloration of Orthotolidine and Artificial Standards for Free Chlorine Test in Water, W. S. Davis and C. B. Kelly. *Am. Water Works Assn.—Journal*, vol. 26, no. 6, June 1934, pp. 757–759. Report on an experiment to determine the effect of sunlight on the deterioration of orthotolidine reagent.

LIME. Lime Slaking, E. E. Harper. *Am. Water Works Assn.—Journal*, vol. 26, no. 6, June 1934, pp. 750–756. Kinds of lime; storage; selection of lime; relative costs; softening with lime; lime slaking; early methods; present methods; high temperature important; mixing milk-of-lime with water to be treated.

TASTE AND ODOR REMOVAL. Taste and Odor Problems at Chester, Pa., R. I. Dodd. *Am. Water Works Assn.—Journal*, vol. 26, no. 6, June 1934, pp. 760–764. Report by chemist of Chester Water Service Company, Chester, Pa., on operating problems and odor determinations.

WATER WORKS ENGINEERING

BOSTON. Boston Metropolitan Water Supply Extension, K. R. Kennison. *New England Water Works Assn.—Journal*, vol. 48, no. 2, June 1934, pp. 147–220, (discussion) 221–250. Report on the development of the Ware and Swift rivers for additional water supply of the Boston Metropolitan District started in 1926; program of new development; description of principal construction items; costs; design and construction of the Quabbin aqueduct tunnel; construction of siphon spillways in the Ware River intake works; design of the Swift River intake.

CAMBRIDGE, MASS. Recent Additions to Cambridge Water Supply, H. M. Turner. *New England Water Works Assn.—Journal*, vol. 48, no. 1, Mar. 1934, pp. 28–45, (discussion) 45–46. Review of existing system serving a population of nearly 120,000; description of extensions and improvements, including new intakes, pumping plant at Fresh Pond, and new cast-iron pipe line through Waltham, all totaling in cost $800,000.

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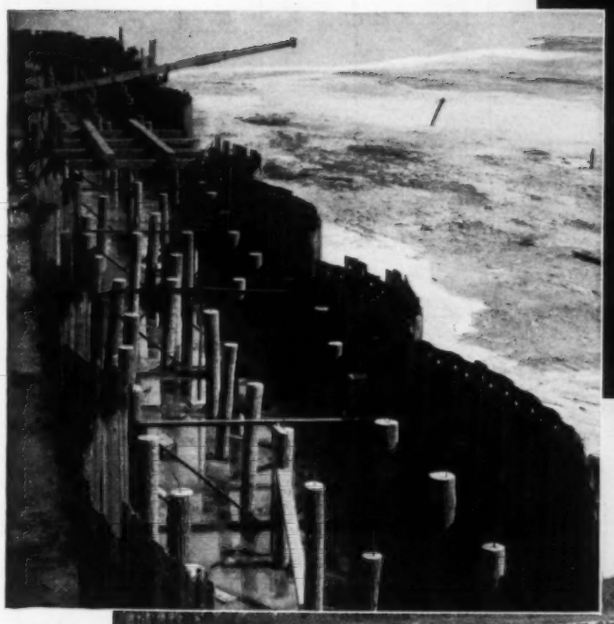
EARTHQUAKE EFFECTS. Earthquake Effects on Water Supplies. *Am. Water Works Assn.—Journal*, vol. 26, no. 6, June 1934, pp. 769–787. Symposium reviewing damage done by southern California earthquake of March 10, 1933: Long Beach, F. S. Porter; American States Water Service Company, C. P. Harnish; Lynwood, A. J. Bateman; Dominguez Water Company, E. P. Tallon; South Gate, L. M. Rothkranz.

OPERATION. Break in Supply Main Brings Permanent Improvement in Quality of Water, M. H. Coblentz. *Am. Water Works Assn.—Journal*, vol. 26, no. 6, June 1934, pp. 765–768. Experience of water supply of Annapolis and Eastport, Md., where a break in a main brought about the establishment of systematic control by main flushing.

Contractors Rely on Inland Piling for Mississippi Waterway



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BRIDGES

DESIGN. Successful Planning of Bridge Waterway Openings, C. H. Eiffert. *Eng. News-Rec.*, vol. 113, no. 9, Aug. 30, 1934, pp. 275–277. Adequacy and uniformity of all openings on stream can be obtained only through regulations requiring that none be fixed finally until approved by some central state or national authority; shape of piers.

MAINTENANCE AND REPAIR. Sheer Booms Embody Unique Features. *Ry. Age*, vol. 96, no. 24, June 16, 1934, pp. 867–869. Protection structures of bridge of the Chicago Rock Island and Pacific Railroad at Seneca, Ill., and of Chicago, Burlington and Quincy bridge at Ottawa; description of floating booms used where rock bottom precluded use of piling; shock absorbers used between booms and cribs; sheetpile cribs.

PIERS, CONSTRUCTION. Deep Open Caissons for Bay Bridge, C. H. Purcell, C. E. Andrew, and G. B. Woodruff. *Eng. News-Rec.*, vol. 113, no. 8, Aug. 23, 1934, pp. 227–233. Construction of three East Channel piers of San Francisco–Oakland Bridge founded on deep stratum of stiff clayey-sand, one pier going to record dept of 240 ft; 16 shallow pile piers built in sheet pile cofferdams of unusual design; caisson details showing system of blocking for removing false bottoms from dredging wells; jetting and sealing; details of steel sheet cofferdams; contractor's equipment and schedule.

PIERS, REPAIR. Internal Grouting Restores Stone Masonry Piers. *Ry. Eng. & Maintenance*, vol. 30, no. 7, July 1934, pp. 372–373. How New York Central reestablished strength of three bridge piers, which had become weakened by disintegration of mortar and consequent loss of bonding strength, by rebonding interior material with cement grout.

PILES CONCRETE. Cores in Reinforced Concrete Piles Formed with Inflated Hose. *Concrete*, vol. 42, no. 8, Aug. 1934, pp. 7–8. Piles with large hollow cores cast and driven by Missouri Pacific Railway as part of groups of one pier and one abutment of new bridge at Dupo, Ill.; advantages are: reduced weight of piles of given diameter and greater ease in handling; reduction in amoun of steel reinforcement and increased circumference of piles of given weight, and consequent increase in skin friction.

STEEL. Long-Span Bridges, R. Freeman. *Ry. Engr.*, vol. 55, no. 8, Aug. 1934, pp. 244–246. Advance of construction of long-span bridges in United States and comparison with European practice; existing bridges in both United States and Europe; types of construction; improvements in quality of steel; applied forces of resistance; construction of joints. Before Int. Congress for Steel Development.

STEEL ARCH, OREGON. Steel Bridge Awarded Prize Is of Three-Hinged Tied-Arch Type. *Eng. News-Rec.*, vol. 113, no. 8, Aug. 23, 1934, p. 248. Description of Dr. John McLoughlin Bridge, over the Clackamas River in Oregon, consisting of central arch span of 240 ft, flanked on either side by similar spans of 140 ft; lateral components of thrust of steel box-girder arches are taken by eye-bar ties that are completely articulated and pass through holes cut in webs of floor beams.

WOODEN. Tests Show Strength of Douglas Fir Stringers After 23 Years Service, J. A. Newlin and G. E. Heck. *Ry. Eng. & Maintenance*, vol. 30, no. 8, Aug. 1934, pp. 427–428. Investigation conducted at U. S. Forest Products Laboratory which developed facts concerning untreated timbers removed from trestles of Chicago, Milwaukee, St. Paul & Pacific Railroad; data obtained point to importance of certain items of inspection routine in determining when stringer must be taken from service.

WOOD PRESERVATION. Inspection and Treatment of Creosoted Materials, E. R. Snodgrass and T. R. Ellis. *Roads & Streets*, vol. 77, no. 7, July 1934, pp. 270–272. Inspection and treatment of defects; preliminary treatment; creosoting and other processes; final inspection. Before 1934 Highway Conference at University of Colorado.

BUILDINGS

EARTHQUAKE RESISTANCE. Earthquakes and Engineering Design. *Engineering*, vol. 138, no. 3581, Aug. 31, 1934, pp. 227–228. Editorial discussion of recently published book entitled *Dynamics of Earthquake-Resistance Structures*, by J. J. Creskoff (McGraw-Hill Publishing Company), whose treatment is based on principle that period of oscillation of proposed building should be arranged to differ by 10 per cent from that of probable earthquake.

WALLS. Die Aussenwand im Skelettbau, W. Weiss. *Zentralblatt der Bauverwaltung*, vol. 54, nos. 13 and 14, Mar. 28, 1934, pp. 165–169 and Apr. 4, pp. 181–182. Analysis of stresses and design of outer walls of steel-framed buildings.

WIND STRESSES. Sollicitations et calculs des bâtiments élevés à ossature sous l'action du vent, A. Deleuse. *Société Belge des Ingénieurs et des Industriels—Bul.* no. 4, 1934, pp. 319–347. Review of European and American studies of wind stresses on high framed buildings; effect of height; European and American specifications referring to wind stresses; wind bracing of buildings; design of buildings against wind stresses; movement of building frames under effect of wind. Bibliography.

CITY AND REGIONAL PLANNING

BENNINGTON, N. H. Attractive Road Entrance Beautifies Village. *Eng. News-Rec.*, vol. 113, no. 7, Aug. 16, 1934, pp. 212–214. State road relocation and bridge replacement at Bennington, N.H., involving taking over land and moving buildings to provide broad plazas and to permit landscaping; rigid-frame design and roadway details.

STOCKHOLM. Wettbewerb fuer eine Staedtebauliche Umgestaltung des Stadtteiles Norrmalm in Stockholm, Liebenthal. *Zentralblatt der Bauverwaltung*, vol. 54, no. 10/11, Mar. 7, 1934, pp. 125–139. Review of competitive designs for replanning of Norrmalm section of Stockholm, Sweden.

CONCRETE

AGGREGATES. Tests Indicate Effect of Fine Clay in Concrete, I. Lyse. *Eng. News-Rec.*, vol., 113, no. 8, Aug. 23, 1934, pp. 233–234. Report on Lehigh University tests supporting claim that requirements which limit fines severely are unnecessary and that, when admixtures are permitted, they are illogical; concrete permeability as affected by clay in sand; durability of concrete with and without clay, as measured by freezing and thawing test.

DAMS DISINTEGRATION. Some Problems of Design of Concrete Dams, W. T. Halcrow. *Water & Water Eng.*, vol. 36, no. 434, Midsummer 1934, pp. 311–318 (discussion) 345–353. Study of disintegration of concrete due to moorland water as observed on British concrete dams; relation between chemical composition of water and rate of disintegration of concrete; bearing of observations on design of concrete dams. Before Instn. Water Engrs.

DISINTEGRATION. Risultati di prove comparative sul comportamento di cementi in acqua di mare e in acqua dolce, P. Peniani. *Annali dei Lavori Pubblici*, vol. 72, no. 2, Feb. 1934, pp. 77–84. Results of 4-year experimentation on disintegration of portland, pozzuolan, and special maritime work cements in sea water and in fresh water, leading to conclusion that pozzuolan cements are most suitable for maritime concrete work.

MOISTURE CONTENT. Rapid Determination of Moisture in Fine Aggregate, W. M. Venable. *Concrete*, vol. 42, no. 4, Apr. 1934, pp. 7–8. Equipment and samples; chart for determination of percentage of moisture in sand; procedure requires less than 1 min if proper equipment is used in combination with chart.

PILES, CONCRETE. Concrete and Creosoted Wood Piles Compared. *Concrete*, vol. 42, no. 6, June 1934, pp. 19–20. It is claimed that concrete piles are the only dependable type in alternate wet and dry locations; their greater load-carrying capacity offsets difference in cost.

PILES, DRIVING. Selecting and Driving Concrete Piles, L. R. Need. *Concrete*, vol. 42, no. 4, Apr., 1934, pp. 5–6. Soil borings essential; load tests supply most reliable information on bearing power; selection of driving equipment; efficiency of pile driving.

READY-MIXED. Control of Ready-Mixed Concrete by Trial Mixtures, K. M. McKelvey. *Concrete*, vol. 42, nos. 8 and 9, Aug. 1934, pp. 5–6, and Sept., pp. 17–20. August: Method advocated as most practical in sections having definite sources of aggregates. September: Procedure followed in maintaining control of quality and yield; laboratory and job records and laboratory equipment.

REFRACTORY MATERIALS. Der Einfluss von Meerwasser im Rohschlamn auf das Klinkerbetonfutter des Drehofens, K. Krassowsky. *Tonindustrie-Ztg.*, vol. 58, no. 33, Apr. 23, 1934, pp. 405–406. Influence of sea water in raw slurry on clinker-concrete lining of rotary kiln; results of experience in Noworossijsk, U.S.S.R., with water from Black Sea containing 1.7 per cent salt; causes of resulting disintegration of kiln lining have not yet been satisfactorily explained.

SILOS. Ueber wirtschaftliche Getreidelagerung im Betonsilo, W. Baumgartner. *Zement*, vol. 24, nos. 20, 21, and 22, May 17, 1934, pp. 282–286, May 24, pp. 295–297, and May 31, pp. 309–311. Economic storage of grain in concrete silos; economic problems involved; behavior of grain during storage; problem of solid concrete construction; grain treatment before and during storage; ventilation of silo.

TESTING. Analysis of Fresh Concrete, W. A. Bleanchette. *Concrete*, vol. 42, nos. 6, 7, and 8, June 1934, pp. 17–18; July, pp. 17–19; and August, pp. 13–14. June: Careful test procedure necessary for high degree of accuracy; two methods described. July: Test by method of weighing in air and water; illustrated examples. August: Determining correction factors due to grinding action of concrete mixing process.

WALLS. Some Observations on Cracking of Thin Concrete Walls, R. W. C Smith. *Water & Water Eng.*, vol. 36, no. 438, Sept. 1934, pp. 515–518. Observations, experiments, and comments on appearance of cracks in concrete walls, 6 to 9 in. thick, of slow sand filters at Langham works of South Essex Water Works Company; water content; retardation of setting; alteration of proportions; effect of weather conditions; fineness of cement; possible remedies; treatment of cracks; test cubes; determination of water content of concrete.

WATERPROOFING. New Block with Waterproof Face Finds Prompt Acceptance, F. J. Straub. *Concrete*, vol. 42, no. 6, June 1934, pp. 15–16. Method of obtaining non-porous, waterproof face on exposed sides and ends of hollow concrete masonry units now in full production in concrete products plant of A. W. Hays, Joliet,

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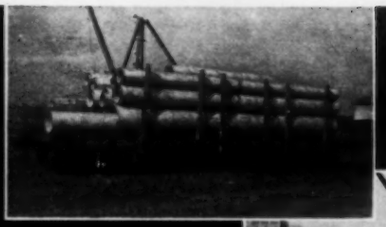

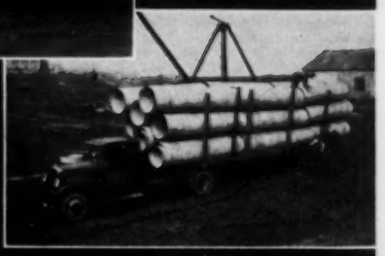

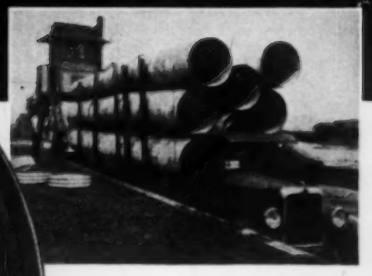

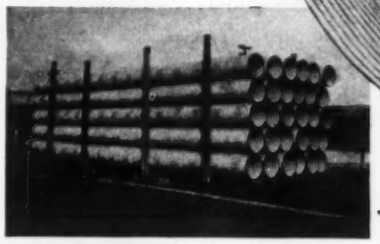

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DAMS

BOULDER DAM PROJECT, HYDRAULIC VALVES. Hydraulic Valves and Gates for Boulder Dam—II, P. A. Kinzie. *Mech. Eng.*, vol. 56, no. 9, Sept. 1934, pp. 523–534. Design of large butterfly valves and their operating mechanisms.

CONCRETE GRAVITY, INDIA. Cauvery-Mettur Reservoir Project, South India. *Engineer*, vol. 158, nos. 4103 and 4104, Aug. 31, 1934, pp. 202–206, and Sept. 3, pp. 233–234. Aug. 31: Dam designed to impound floodwater during S.W. monsoon, to serve as flood moderator, and for hydro-electric purposes; reservoir has capacity of 93,500 million cu ft; total cubic content of dam is 54 million cu ft; entire dam built in portland-cement concrete. Sept. 7: Particulars of control gear designed by Glenfield and Kennedy; needle regulating control valves; low-level and high-level culverts; surplus gates.

MASONRY, AUSTRALIA. Nepean Dam, Sydney Water Supply. *Engineer*, vol. 158, no. 4104, Sept. 7, 1934, pp. 240–241 and 236. Dam will create reservoir with storage capacity of 21,721 million gal; reservoir will control 123 sq miles of catchment area; cost will be £1,554,000; it is cyclopean sandstone masonry structure of curved gravity type, with radius of curvature of 1,200 ft at upstream vertical face.

SPECIFICATIONS, EARTH. Pine View Dam and Appurtenant Works, Ogden River Project, Utah. *U. S. Bur. Reclamation—Specifications*, no. 584, 1934, 101 pp., 64 supp. sheets. Schedule, specifications, and drawings for construction of earth and rock-fill dam, 75 ft maximum height, about 500 ft long; also of concrete-lined outlet tunnel, 600 ft long; 72-in. welded-plate steel penstock; 60-in. welded-plate steel irrigation outlet, etc.

FLOOD CONTROL

DISCHARGE. Computation of Floodflows by Slope-Area Method, A. H. Davison. *Eng. News-Rec.*, vol. 113, no. 8, Aug. 23, 1934, pp. 244–246. Study of data for developing method of determining river discharge from high-water marks showing that the roughness coefficient varies, corresponding to value of wet perimeter.

FORECASTING. Note sur la propagation et l'annonce des crues, Bachet. *Annales des Ponts et Chaussées (Partie Technique)* vol. 1, no. 3, May–June 1934, pp. 409–465. System of forecasting and announcing of floods in basin of Loire River, France; mathematical theory of propagation of flood waves; attenuation of flood waves; effect of lateral spillways; graphic method for prediction of height of floods and sending out of warnings.

MISSISSIPPI RIVER. Die Neue Entwicklung des Hochwasserschutzes am Mississippi, E. Schleiermacher. *Bauingenieur*, vol. 15, nos. 1 and 2, Jan. 5, 1934, pp. 15–16. Review of recent developments in flood protection on the Mississippi River, with special reference to tests of hydraulic models at the Vicksburg laboratory; comparison of American and German methods of hydraulic model testing.

RIVERS, IMPROVEMENT. Bank-Revetment Developments on Mississippi River. II—Tetrahedron-Block Revetment. *Eng. News-Rec.*, vol. 113, no. 1, July 5, 1934, pp. 5–8. Description of plant and process of manufacture of tetrahedral concrete blocks for placing over gravel mat in Memphis and Vicksburg districts; details of metal form cups for molding of blocks.

VERMONT. Shovels and Trucks Rush Earthfill on Winooski Flood-Control Dams. *Eng. News-Rec.*, vol. 113, no. 9, Aug. 30, 1934, pp. 266–267. Construction of two earthfill dams in Vermont, totaling about 1,700,000 cu yd of fill, and of other structures entirely by CCC crews; construction was mechanized following winter season of hand labor; concrete diversion conduits built during cold weather.

FLOW OF FLUIDS

MEASUREMENT. Venturi Flume, F. V. A. E. Engel. *Engineer*, vol. 158, nos. 4099 and 4100, Aug. 3, 1934, pp. 104–107, and Aug. 10, pp. 131–133. Comparison of Venturi flume with weir as measuring device; attempt made to explain meaning and importance of Reynolds, Boussinesq, and Froude numbers as criteria for purpose of analyzing hydraulic features of Venturi flume; head losses; meaning of flow criteria; design of free-discharging Venturi flumes.

FOUNDATIONS

BRIDGE PIERS. Underpinning Bridge Pier in Open, H. Englander. *Roads & Streets*, vol. 77, no. 7, July 1934, pp. 273–274. Underpinning of three piers of Index Bridge at Texarkana, Ark., each consisting of two 10-ft cylinders carried to bedrock by pneumatic process.

HYDRAULIC ENGINEERING

HYDRAULICS. Reynolds Number, D. S. Clark. *Combustion*, vol. 6, no. 1, July 1934, pp. 29–30. Analysis of equations developed by O. Reynolds; curves showing kinematic viscosity of water and air; relation of friction factors and Reynolds numbers.

MODELS. Les essais sur modèles en hydraulique, J. Blockmans and J. Lamoen. *Annales de l'Association des Ingénieurs Sortis des Ecoles Spéciales de Gand*, vol. 24, 5th series, 1934, pp. 21–38, 1 supp. sheet. Review of methods of hydraulic experimentation with special reference to principle of similitude and its perturbations; application of model studies for practice; brief description of Antwerp hydraulic laboratory of Belgium Ministry of Public Works.

HYDROLOGY METEROLOGY, AND SEISMOGRAPHY

RIVERS, IMPROVEMENT. Die Oder als Wasserstrasse, Krieg. *Zentralblatt der Bauverwaltung*, vol. 54, no. 10/11, Mar. 7, 1934, pp. 139–141. Hydrology of Oder River, Germany; review of existing and proposed reservoirs and structures for its regulation.

IRRIGATION

IRRIGATION, CANALS, LINING. Brick Lining Used for Irrigation Canal in Texas, W. I. Gilson. *Eng. News-Rec.*, vol. 113, no. 8, Aug. 23, 1934, pp. 246–247. Results obtained from brick lining of experimental 500-ft section of irrigation canal on distribution system of Water Improvement District No. 6, Los Fresnos, Tex., indicating advantages of low cost, inexpensive equipment, minimum of skilled labor required, and satisfactory hydraulic properties.

MATERIALS TESTING

CONCRETE. Apparatus to Determine Linear Expansion of Concrete Bars Due to Temperature Changes, S. L. Meyers. *Rock Products*, vol. 37, no. 8, Aug. 1934, pp. 38–39. Method and apparatus for rapidly measuring thermal expansion of neat cement or concrete bars; all cements tested showed greater coefficient of expansion than any concrete made with common aggregate; it follows that leaner mix, less expansion, and contraction will occur as a result of temperature changes.

MUNICIPAL ENGINEERING

CAUSEWAYS, NEW YORK. New Causeway Entrance to Famous Beach Park, S. Shapiro. *Eng. News-Rec.*, vol. 113, no. 9, Aug. 30, 1934, pp. 259–265. Construction of new access road, 7½ miles long, for Jones Beach State Park, Long Island, built on 10,000,000 cu yd of hydraulic fill dredged from new boat channels; design and construction of pavement, bridges, and intersections; typical sections and plans for parkways, causeways, and parking fields at Jones Beach State Park; rolling 8 cinder base for bituminous wearing surface.

PORTS AND MARITIME STRUCTURES

AFRICA. Le port de Casablanca, G. Toutlemonde. *Génie Civil*, vol. 105, no. 8, Aug. 25, 1934, pp. 161–164. Description of port of Casablanca on Atlantic coast of Morocco; report on recent construction, including breakwater over 2,600 m long; features of new reinforced concrete grain silo; commercial statistics for years 1912 to 1933.

CHERBOURG. Cherbourg Harbour Works. *Engineer*, vol. 158, nos. 4100, 4101, and 4102, Aug. 10, 1934, pp. 128–131 and 138; Aug. 17, pp. 152–154 and 162; and Aug. 24, pp. 179–181. Illustrated description of recent improvements: Aug. 10: Fare Maritime and deep-water quay; Jetée de Flamands; mole; construction and sinking of caissons. Aug. 17: Dredging; new maritime-station buildings. Aug. 24: Deep-water quay extensions; cost of works.

FRANCE. Compte rendu de la situation des travaux maritimes dans les ports de France. *Annales des Ponts et Chaussées (Partie Technique)*, vol. 1, no. 3, May–June 1934, pp. 267–304. Review of improvements and cost of construction in ports of France from Dunkerque in North to Nice in Mediterranean.

GUAYAQUIL, ECUADOR. Port of Guayaquil—Ecudor's Commercial Center. *Naut. Gaz.*, vol. 124, no, 16, Aug. 4, 1934, pp. 6–9. Port developments and characteristics; quay, extending along water front, provides 60-ft broad space where commodities are handled; tables of exports and imports through Guayaquil for 1933; warehouse facilities; lighterage and stevedoring in hands of customs administration.

SINGAPORE. Port of Singapore, G. W. A. Trimmer. *Dock & Harbour Authority*, vol. 14, no. 163, May 1934, pp. 207–212; see also *Far Eastern Rev.*, vol. 30, no. 6, June 1934, pp. 277–281. Brief reference to early history of dock undertakings at Singapore; concise description of Singapore Harbor Board's wharf and dock accommodation; rates and charges; salvage equipment.

ROADS AND STREETS

BITUMINOUS. Gradation of Aggregates for Bituminous Surfaces, J. N. Doherty. *Roads & Streets*, vol. 77, no. 7, July 1934, pp. 275–276. Advantage of grading of aggregates; oil-mixtures; stability in aggregate. Before 1934 Highway Conference at University of Colorado.

Study of Methods of Building Low-Cost Bituminous Roads—I, J. T. Pauls. *Am. City*, vol. 49, no. 9, Sept. 1934, pp. 70–73. Grouping of bituminous types; bituminous surface courses; bituminous surface treatments. Before University of Michigan Highway Conference.

CAST IRON. Cast-Iron Blocks Prolong Life of Road Surfaces in Europe, E. W. Davis. *Steel*, vol. 95, no. 6, Aug. 6, 1934, pp. 31–33 and 40. Systems and types used in England; advantages and costs.

COLD WEATHER CONSTRUCTION Lay Street Railway Paving Concrete in Zero Weather. *Concrete*, vol. 42, no. 6, June 1934, pp. 6–7. Successful concrete street paving work in Detroit during extremely cold weather of past winter adds further strength to growing realization that concrete paving work may be continued throughout winter months.

CONSTRUCTION. Rolling Bituminous Surfaces. *Am. City*, vol. 49, no. 8, Aug. 1934, p. 44. Details of resurfacing in southern Georgia, on U. S. Route 41, bituminous concrete pavement, 20 ft wide, given covering of emulsified asphalt and rolled with Austin Roll-a-Plane.

Stabilizing Weak Subgrades, F. H. Eno. *Am. City*, vol. 49, no. 8, Aug. 1934, pp. 54–55. Experimental treatments; results from concrete roads; summation of experimental work; results for each stabilizing material; results observed on untreated sections. Before Twentieth Annual Purdue Road School.

GRADING. Management and Power Shovel Production in Highway Grading, A. P. Anderson. *Roads & Streets*, vol. 77, no. 7, July 1934, pp. 255–263. Analysis of effect of operating characteristics on time losses and production rates as found in recent field studies on 51 power shovels; average percentage of actual working time lost in minor delays from various causes; average percentage of available time lost in major delays; coordination of excavating, hauling, and dumping average shovel cycles.

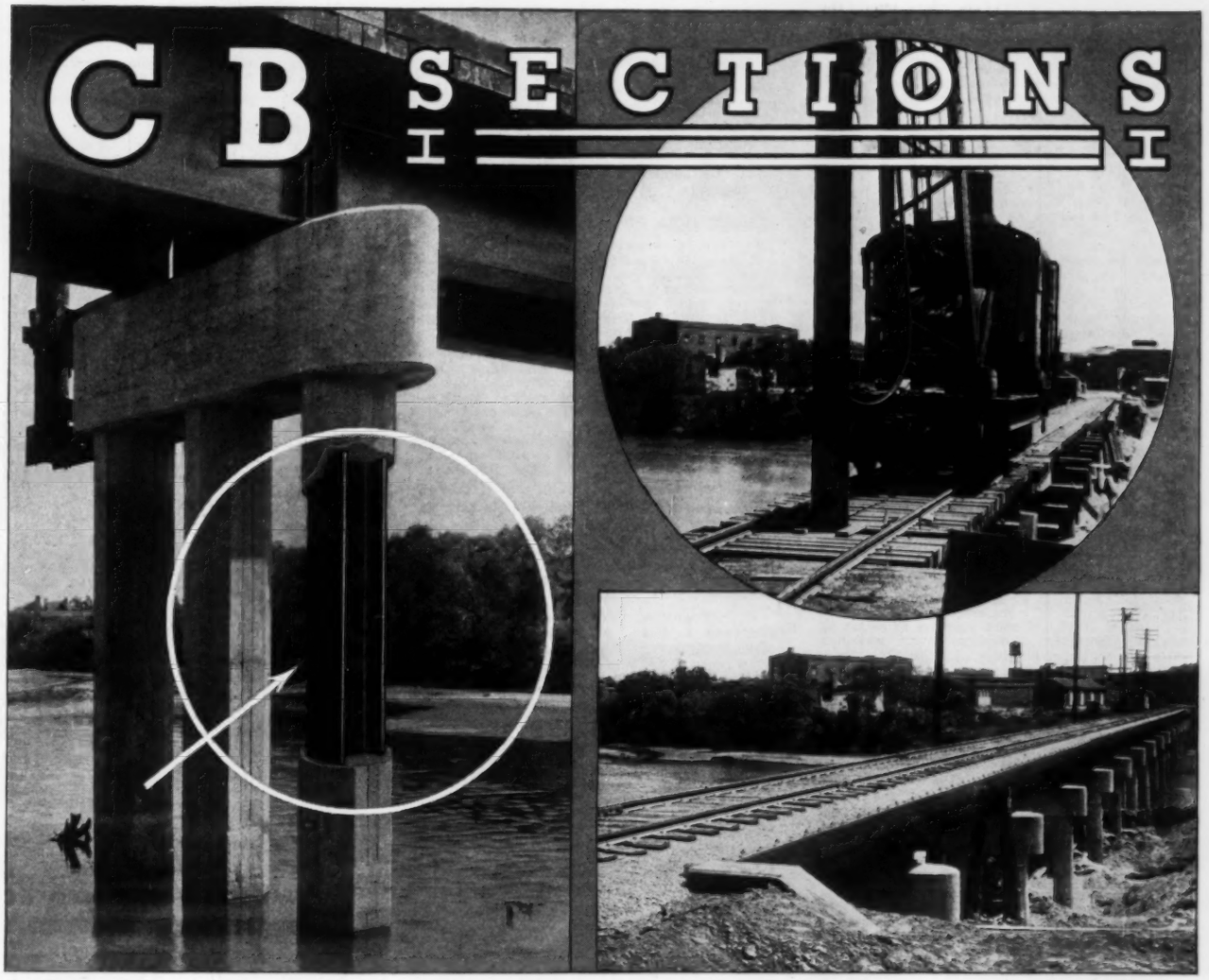
GRAVEL. Relocated Huntsville Highway at Pine View Reservoir, Ogden River Project, Utah. *U. S. Bur. Reclamation—Specifications*, no. 588, 1934, 38 pp., 22 supp. sheets. Schedule, specifications, and drawings for 3½ miles of oil-gravel road known as relocated Huntsville highway.

GREAT BRITAIN. British Road Developments of Past Fifteen Years, C. H. Bressey. *Soc. Chem. Industry—Journal (Trans & Communications)*, vol. 53, no. 31, Aug. 3, 1934, pp. 241T–245T (discussion) 245T–246T. Progress in execution of Trunk Road Program, comprising improvement of nearly 1,000 miles of most important Class A1 roads; deficiencies for present needs of older bridges owned by railway and canal companies; marking of crossing places for pedestrians following example of "passages cloutes" in Paris; discussion on modern methods of road making.

GUARD RAILS. Method of Testing Highway Guard-Fence, P. J. Freeman. *Am. City*, vol. 49, no. 7, July 1934, pp. 42–44. Early tests on wire rope highway guard-fence; recent tests by author at Canton, Ohio. Before Twentieth Annual Road School at Purdue University, Lafayette, Ind.

HIGHWAY ENGINEERING, CANADA. Technical and Administrative Aspects of Highway Construction Considered at Road Convention at Murray Bay. *Eng. & Contract Rec.*, vol. 48, no. 38, Sept. 19, 1934, pp. 768–785. Proceedings of 1934 annual meeting of Canadian Good Roads Assn.; summaries of papers and discussions on: protection against frost heaving; financing building of roads; maintenance of gravel roads; cement concrete road construction; possibilities of soil concrete; low-cost pavements; highways for winter traffic; regulation of common carrier vehicles, etc.

HIGHWAY, PAN-AMERICAN. Proposed Inter-American Highway. *Engineer*, vol. 158, no. 4104, Sept. 7, 1934, p. 244. Continuous public highway, serviceable for automobiles and other vehicles at all times of year, through Mexico and Central American from United States boundary to City of Panama, is project under active consideration by countries concerned, with technical and financial assistance from U.S. Government.



● *The above photograph shows diagramatically the manner in which the steel bearing piles are encased in concrete*

● ABOVE: *The steel bearing piles were driven through the deck of the old structure, without interruption to railway service*

● BELOW: *The finished structure, a Missouri Pacific Railroad Co. bridge at Wichita, Kansas*

STEEL BEARING PILES *now successfully used for* RAILROAD BRIDGES....

● CB SECTIONS, long used successfully as bearing piles under highway bridges, have now been used with equally satisfactory results under a railroad bridge. The accompanying photograph shows the manner in which the steel bearing piles are used—three to a bent. The steel was encased in concrete merely for protection. The piles were driven from the replaced structure without interruption to service.

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MAINTENANCE AND REPAIR. Revamping Old Street in Springfield, Mo., W. G. Hill. *Eng. News-Rec.*, vol. 113, no. 8, Aug. 23, 1934, pp. 241–243. Bad section of through-city route modernized to main-road standards through skilled salvage of old pavement by resurfacing and widening; expansion joint of metal-air type; resurfacing concrete.

SEWERAGE AND SEWAGE DISPOSAL

AERATION. Mechanical Aeration of Sewage by Sheffield Paddles and by Aspirator, H. E. Babbitt. *Univ. Ill.—Eng. Experiment Station—Bul.*, no. 268, vol. 31, no. 44, July 3, 1934, 54 pp., 1 supp. sheet. Results of tests of efficacy of Sheffield paddle aerator; study of aspirating devices for aerating sewage in activated sludge process; air diffusion aerator was used as check on some of results obtained from aspirator; sludge-settling rates; microscopical observations; sludge density and pH; bio-chemical oxygen demand modulus.

BEACHES, POLLUTION. Standards for Bacterial Quality of Water at Natural Bathing Places, G. C. Houser. *Am. City*, vol. 49, no. 8, Aug. 1934, pp. 51–52. Diseases attributed to bathing in polluted water; bacterial standards for water at natural bathing places. Bibliography.

CONCRETE CONSTRUCTION. Milwaukee Sewage Disposal Project Is Model of Construction. *Concrete*, vol. 42, no. 6, June 1934, pp. 3–5. Methods and equipment employed in constructing huge plant on Jones Island, Milwaukee; 52,000 yd of concrete pumped for distances up to 990 ft; handling material at mixing plant; wall-form panels given many re-uses.

FILTERS, VACUUM. Sewage Clarification at Rockville Center, N.Y. *Am. City*, vol. 49, no. 4, Apr. 1934, pp. 43–47. Experience of town having population of 18,000 with vacuum filtration of sewage; refiltration of cloudy filtrate; pumping installation; paper pulping; chemical treatment; sludge filtration; costs.

NEWTON, MASS. Newton High-Level Sewer, A. L. Shaw. *Boston Soc. Civ. Engrs.—Journal*, vol. 21, no. 2, Apr. 1934, pp. 95–114. Design and construction of about 6,000 ft of concrete-lined sewer in open cut or as tunnel in rock, about 5.2 ft wide to serve population of about 76,000; tunnel survey methods; progress; ground-water leakage; safety measures; costs.

PLANTS, CONSTRUCTION. Belt Conveyors Distribute Concrete for 30-Acre Ward's Island Sewage Plant. *Construction Methods*, vol. 16, no. 6, June 1934, pp. 26–30.

PLANTS, INDIANAPOLIS, INDIANA. Sanitary Works of Indianapolis, C. K. Calvert. *Am. Journal Pub. Health*, vol. 24, no. 7, July 1934, pp. 739–742. Method of treatment; operating costs. Before State Sanitary Engrs. and Am. Pub. Health Assn.

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SLUDGE. Filtration and Incineration as Means of Sludge Disposal. G. P. Edwards. *Sewage Works Journal*, vol. 6, no. 3, May 1934, pp. 444–449. Sludge conditioners; dewatering fresh solids; dewatering mixed fresh and activated sludge; dewatering digested sludge; incineration. Bibliography.

Novel Method of Measuring Sludge, W. A. Sperry. *Mun. Sanitation*, vol. 5, no. 6, June 1934, pp. 188–189. Experiments with different methods leading to development of tipping bucket sludge meter.

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TEXTILE MILLS, WATER TREATMENT. Quality of Water for Textile Mills and Treatment of Their Wastes, E. B. Besselievre. *Am. Dyestuff Reporter*, vol. 23, no. 15, July 16, 1934, pp. 397–402. Methods of procuring sufficiently clear supply of water at least expense; ways in which pollution of supplies by wastes from textile mills may be abated or prevented. Before Am. Assn. Textile Chemists and Colorists.

WASTE DISPOSAL. Milk Waste Treatment Studies in Wisconsin, H. Ruf and L. F. Warrick. *Sewage Works Journal*, vol. 6, no. 3, May 1934, pp. 580–595. Study by Wisconsin State Board of Health of development of efficient and economical methods for treatment to secure inoffensive disposal of milk plant wastes, and practical application of such methods in solution of pollution problems, description of plants; method of conducting studies; quantity and pollutional strength of milk wastes; plant operation; filter loadings and efficiencies; biological studies. Bibliography.

Pollutional Character of Flax Retting Wastes, E. F. Howard, G. W. Gleeson, and F. Merryfield. *Sewage Works Journal*, vol. 6, no. 3, May 1934, pp. 596–600. Study of flax waste solution of Oregon streams; bio-chemical oxygen demand of flax retting waste; stability of flax retting waste in terms of 20-day oxygen demand; flax fiber production; stream pollution; Salem retting plant; character of wastes; treatment of wastes. Bibliography.

STRUCTURAL ENGINEERING

FLOORS, CONCRETE JOISTS. Precast Joists and Monolithic Slab Form Ideal Concrete Floor. *Concrete*, vol. 42, no. 7, July 1934, pp. 13–14. Architects and engineers urged to give wider recognition to new floor construction; design table presented; type adapted to light and moderate floor loads

PLATES, STRESSES. Buckling of Regular Hexagonal Plates, S. Iwato. *Soc. Mech. Engrs. Japan—Journal*, vol. 37, no. 207, July 1934, pp. 432–433. Determination of critical loads for buckling of plate at time when loads are directed from two apexes to center, and for buckling of plate at time when loads are directed along line joining middle points of bases located opposite to center. (In Japanese, with brief English abstract, p. S-68-69.)

STRUCTURAL DESIGN. Design of Rectangular, Symmetrically-Reinforced Members, H. Carpenter. *Engineering*, vol. 138, no. 3582, Sept. 7, 1934, pp. 255–256. Short and convenient method of calculation of members with symmetrical reinforcement subjected to bending combined with compression is developed.

WIND STRESSES. Action du vent sur les constructions, L. Baes. *Societe Belge des Ingenieurs et des Industriels—Bul.*, no. 4, 1934, pp. 359–376. Review of Goettingen experiments on effect of wind blowing on isolated structural steel angle from various directions, and report on University of Brussels, Belgium, experimental wind tunnel study of stresses induced in columns built up of structural steel angles by wind blowing from various directions; inadequacy of usual formulas; necessity of experimental research in wind tunnel and in field.

TUNNELS

REPAIR WELDING. Electric-Arc Welding Saves 40-Year-Old Viaduct. *Ry. Eng. & Maintenance*, vol. 30, no. 8, Aug. 1934, pp. 432–436. Manner in which arc process was employed in strengthening and repairing O-Street viaduct at Lincoln, Nebr., by the Chicago, Burlington & Quincy Railroad, at relatively low cost.

SEWER TUNNELS. Liner Plates Carry Fills in Undertrack Tunneling. *Eng. News-Rec.*, vol. 113, no. 9, Aug. 30, 1934, pp. 277–279. Construction of three drainage and sewer tunnels under railroad tracks at Palmer, Ind., Richmond, Va., and Dallas, Tex., involving varying uses of pressed-steel plates to hold fill until permanent lining could be placed; hand-jacked shield used in one tunnel; all three tunnels have internal diameter of 12 ft or more.

WATER SUPPLY, GREAT BRITAIN. Preston Aqueduct Tunnels, E. C. Oakes. *Water & Water Eng.*, vol. 36, no. 434 Midsummer 1934, pp. 330–336. Driving and lining of flow-line water supply tunnel, 1,000 yd in length, connecting Langden Valley intake works with storage reservoirs near Longridge, for Preston Corporation Water Works. Before Instn. Water Engrs.

WATER TREATMENT

ANALYSIS. Some Modern Methods of Chemical Analysis and their Application to Water, J. Grant. *Water & Water Eng.*, vol. 36, no. 437, Aug. 1934, pp. 470–471. Modern methods of testing water for presence of chlorides, sulfates, hardness, carbonates, aluminum, chlorine, and phosphates.

CHLORINATION. Modern Water Chlorination Practice, L. H. Enslow. *New England Water Works Assn.—Journal*, vol. 48, no. 1, Mar. 1934, pp. 6–14 (discussion) 14–22; see also *Am. Water Works Assn.—Journal*, vol. 26, no. 5, May 1934, pp. 579–589. Combating taste troubles; super and dechlorination; permanganate treatment; prechlorination; post-ammoniation; modern ammoniation; activated carbon and prechlorination; some important aspects of prechlorination; ideal plant operating arrangement; some incidental uses of chlorine.

FILTRATION PLANTS, WASHINGTON, D.C. Unorthodox Arrangement of Water-Works Units, R. B. Morse. *Am. City*, vol. 49, no. 9, Sept. 1934, pp. 59–62. Novel features of 5,000,000-mgd filtration plant at Burnt Mills; cylindrical arrangement of plant units; filters are uncovered; costs. Before Maryland-Delaware Water and Sewerage Assn.

WATER WORKS ENGINEERING

EDUCATION. Training Men for Water Supply J. J. Hinman, Jr. *Water Works Eng.*, vol. 87, no. 11, May 30, 1934, pp. 532–535. Instruction in water works at the University of Iowa.

GERMANY. Stand der Wasserversorgung in Deutschland, T. Ploppa. *VDI Zeit.*, vol. 78, no. 30, July 28, 1934, pp. 897–902. Review of recent progress in water supply engineering in Germany, including methods of water prospecting and utilization of sources of water supply, conveyance of water, water treatment and purification, service connections, water storage, problems of small water works, extension and modernization of water works.

GRAVEL WALLS. Gravel Wall Wells, R. R. Schweitzer. *Am. Water Works Assn.—Journal*, vol. 26, no. 6, June 1934, pp. 712–724. Types; construction methods; bailing-in process; combined rotary and development process; California stove-pipe casing; "pull-back" method; under reaming to larger diameters; experimental methods; recent developments; circular nozzle device.

GREAT BRITAIN. British Waterworks Association. *Water & Water Eng.*, vol. 36, no. 436, July 1934, pp. 421–434. Record of proceedings and abstracts of papers: Presidential Address, T. Paris; Annual Report of Executive Committee; Consumption, Misuse, and Waste of Water, J. Bowman; Chlorination of Water Supplies, P. S. Lelean.

LAWS AND LEGISLATION. Validity of Water Obligations, L. T. Parker. *Water Works Eng.*, vol. 87, no. 13, June 27, 1934, pp. 715–716. When a city may avoid payment for water-works improvements; definition of legal indebtedness; when city council can fix water rates; case in which subsequent law does not repeal first one.

MANAGEMENT. Income and Operating Costs for Water Supply for Various Cities for 1932, W. C. Rudd and A. C. Michael. *Am. Water Works Assn.—Journal*, vol. 26, no. 6, June 1934, pp. 793–795. Statistical data for about 50 cities of Eastern, Southern, and Middle Western states.

METERS. Why Water Meters Need to Be Heat Resistant, G. Read. *Am. Water Works Assn.—Journal*, vol. 26, no. 6, June 1934, pp. 693–703. Practical discussion by meter and service superintendent of Department of Water and Power of Los Angeles, Calif.; meter pistons damaged by hot water; water meter protection valves.

NEWTON, MASS. Engineering Problems Connected with Recent Improvements to Newton, Mass., Water Supplying Works, G. A. Sampson. *New England Water Works Assn.—Journal*, vol. 48, no. 1, Mar. 1934, pp. 88–101. Improvements in well supply and in pumping stations; duty tests; pumping and generating costs; construction cost.

RATE MAKING. Water Rates and Service Charges, Installation Charges, Hydrant Rentals and Sprinkler Costs—V. *Am. City*, vol. 49, no. 9, Sept. 1934, pp. 87–89, 91 and 93. Abstracts of water department and company reports: Jacksonville, Fla., O. Z. Tyler; Nashville, Tenn., R. L. Lawrence, Jr.; Lima, Ohio, E. E. Smith, 2d; Painesville, Ohio, C. S. Fullerton; Watertown, N.Y., H. J. Haley; Allentown, Pa., W. R. Schnabel; New Haven, Conn., R. B. Welch; Taunton, Mass., A. C. King; Newton, Mass., R. H. Ellis; Mamaroneck and Harrison, N.Y., W. E. Thrasher; Poughkeepsie, N.Y., T. F. Lawlor; Mt. Penn Borough, Pa., C. H. Boas; Ripon City, Wis., F. H. Chambers; Beloit City, Wis., F. H. Chambers; Tuscon, Ariz., P. J. Martin; Milford, Conn., R. B. Welch; Beverly, Mass., J. W. Blackmer; Worcester, Mass., L. A. Goodale; Ogden, Utah, H. F. Irwin; Kingston, N.Y., W. D. Cashin; Keene, N. H., P. F. Babidge; Newark, N.J., W. B. Bank; Dallas, Tex., J. B. Winder; Mobile, Ala., T. C. White; Ottumwa, Iowa, H. A. Brown; Pittsburgh, Pa., W. C. Donnan; Petersburg, Va., C. W. Davis, Jr.

RURAL. Pumping of Rural Water Supplies, H. R. Lupton. *Water & Water Eng.*, vol. 36, no. 434, Midsummer 1934, pp. 318–330 (discussion) 353–360. Water supplies for scattered population; population density required to justify piped supply; pumping plants for farms, villages, and regional supplies; optimum size of mains; length and diameter of regional networks; regional pumping plant for 50,000 persons; automatic electrically-driven pumping plant for 1,000 persons; comparison of annual cost of separate village supply with that of regional network.

SAN FRANCISCO. From Sierra to San Francisco. *Eng. News-Rec.*, vol. 113, no. 5, Aug. 2, 1934, pp. 129–146. Symposium, including the following papers: Foreword by M. M. O'Shaughnessy, San Francisco's Water Supply; How Hetch Hetchy Aqueduct Was Planned and Built, L. T. McAfee; Operating Hetch Hetchy Aqueduct and Planning for Future; Hetch Hetchy Water Rights Complicated by Unusual Claims. Bibliography.

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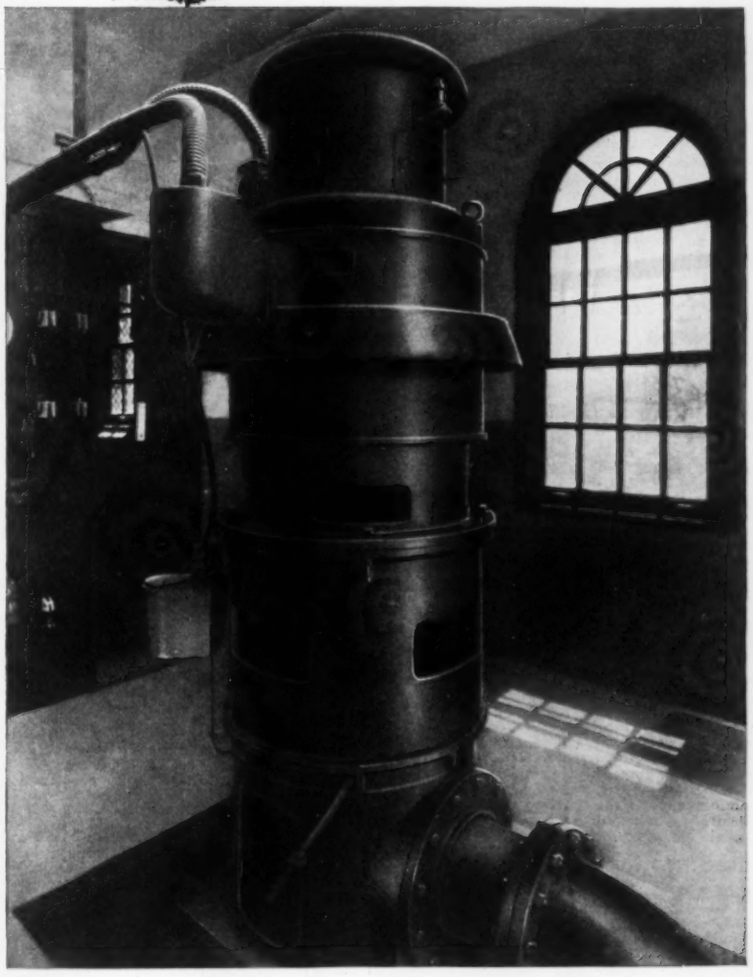

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BRIDGES

ARCH, CONSTRUCTION. Determining Elevations for Centering for Arch Bridge, C. Curry, Jr. *Eng. News-Rec.*, vol. 113, no. 11, Sept. 13, 1934, p. 344. Formulas for finding elevations at any point along intrados, for purpose of erecting posts for centering.

BASCULE, LOUISIANA. New Bascule Span Replaces Two Old Swing Spans. *Ry. Age*, vol. 97, no. 10, Sept. 8, 1934, pp. 279–282. Scherzer rolling-lift structure carries tracks of Texas and Pacific over Harvey canal, near New Orleans; double-track bridge takes place of two movable-span railroad bridges over old canal; unusual design of superstructure; interlocking plant; construction procedure; track changes.

CONCRETE. Features of Concreting on New Cape Cod Canal Highway Bridges. *Contractors & Engrs. Monthly*, vol. 29, no. 3, Sept. 1934, pp. 21–27. Pouring of footings of piers at rate of 200 cu yd per hr and without interruption; general description of Cape Cod bridge projects; distribution of concreting facilities; sand washing plant; form work and concreting abutments; lubrication schedule.

CULVERTS, DESIGN. Design of Waterway Areas for Bridges and Culverts. *Oregon State Highway Commission—Highway Dept.—Tech. Bul.*, no. 4, July 1934, 96 pp. Compilation on economic design of waterway areas and results of research by Oregon State Highway Department in past 15 years; proportioning waterway areas directly from formulas, drainage tables, or from flood discharge; relieving backwater heads; effect of piers; deepening of channel due to construction; theory of scour; current stresses; ice effects; drift impact.

FLOORS, CONCRETE. Vereinfachung der Berechnung von Fahrbahnplatten und Hofkellerdecken. H. Perl. *Zement*, vol. 23, no. 23, June 7, 1934, pp. 323–326. Simplification in calculation of reinforced concrete slabs for bridge and cellar decks; simple expressions for bending moments are derived; analysis of wheel loads; examples; table for calculation of bending moments.

FLOORS, SEATTLE. Service Performance of Grid Deck on University Bridges, Seattle. *Eng. News-Rec.*, vol. 113, no. 12, Sept. 20, 1934, p. 376. After nearly 1½ years of regular service in traffic, grid bridge decking of University Bridge across Lake Washington ship canal, Seattle, is reported to perform excellently.

FOUNDATIONS. Blasting Rock Underwater Without Drilling, J. Graham. *Excavating Engr.*, vol. 28, no. 9, Sept. 1934, pp. 413–415. Method used to excavate bedrock for pier foundations of Golden Gate Bridge because of high velocity and roughness of water; blasting tube used to guide charges.

RIVER CROSSINGS, OKLA. Pipeline Suspension Bridge Built near Hominy, Okla., Embodies Novel Structural Features, L. G. E. Bignell. *Oil & Gas Journal*, vol. 33, no. 11, Aug. 2, 1934, pp. 8 and 31. Details of bridge constructed to carry one 8-in., one 10-in., and one 12-in. welded pipeline over Big Hominy Creek; span of 240 ft; 2 cables, made for 1⅜-in. single-strand galvanized plow steel bridge cable, 37 wires each, carried over top of towers and resting on cable saddles with 4-ft radius; 10 suspenders made from galvanized iron rod ¾ in. in diameter divide span into 11 panels.

RIVER CROSSINGS, TEXAS. Pipeline Bridge Is Built in Rapid Time at Low Cost. E. S. Post. *Oil Weekly*, vol. 75, no. 1, Sept. 17, 1934, p. 31. Brief description of simple type suspension bridge for carrying 12-in. line across Frio River at San Antonio, Tex.; line originally crossed under water by means of 3 strings of 8-in. pipe; corrosive soil and water made replacement necessary frequently; cost of bridge was $7,650, including all labor and materials.

STEEL TRUSS, NEW HAMPSHIRE. High-Level Bridge Link in Dover-Portsmouth Road. *Eng. News-Rec.*, vol. 113, no. 13, Sept. 27, 1934, pp. 387–390. Design and construction of steel-truss highway bridge over Little Bay between Portsmouth, N.H. and Dover, N.H.; total length 1,528 ft; max. span 275 ft; width 32 ft.

STEEL TRUSS, WASHINGTON. Columbia River Highway Bridge at Grand Coulee Dam, Columbia Basin Project, Washington. *U. S. Bur. Reclamation—Specifications*, no. 593, 1934, 37 pp., 52 supp. sheets. Schedule, specifications, and drawings for construction of cantilever-type steel bridge; 950 ft total length; 550 ft max. center span; supported on four reinforced concrete piers and having reinforced concrete approaches at each end.

STEEL, WELDED. Electrically Welded Railway Bridges, O. Bondy. *Ry. Engr.*, vol. 55, no. 9, Sept. 1934, pp. 277–281. Advantages of welded over riveted structures; table giving data on welded plate girders subjected to two million reversals of load; specifications and types of some welded railway bridges in Germany and Austria; typical construction.

STRESSES. Loading Tests on Steel Deck Plate Girder Bridge with Integral Concrete Floor. *Oregon State Highway Commission—Highway Dept.—Tech. Bul.*, no. 3, July 1934, 27 pp. Test of bridge consisting of central I-beam span 70 ft long, to determine degree of monolithic action under load, when steel girder beams are employed in connection with reinforced concrete deck integrally connected by suitable connection types, rigidly connected to steel girders and extending upward into concrete deck.

STRUCTURES, IRON AND STEEL. Report of Committee XV—Iron and Steel Structures. *Am. Ry. Eng. Assn.—Bul.*, vol. 35, no. 364, Feb. 1934, pp. 1011–1064. Revision of manual; specifications for steel railway bridges, for fixed spans not exceeding 400 ft in length.

WIND STRESSES. Drag Coefficients for Structures Studied in Wind-Tunnel Model Tests, W. W. Pagon. *Eng. News-Rec.*, vol. 113, no. 15, Oct. 11, 1934, pp. 456–458. Discussion of German tests on model bridge trusses, which indicate that drag coefficient of 2.0 for complete bridge may be expected; in terms of wind pressure this is $0.0051\ V^2$ lb per sq ft.

WIRE ROPE, MANUFACTURE. Manufacture of Suspension Bridge Wire, F. A. Westphal. *Wire & Wire Products*, vol. 9, no. 8, Aug. 1934, pp. 240–244 and 254–255. Processes required to produce satisfactory bridge wire from billet through to finished wire.

WOODEN, STANDARDIZATION. Report of Committee VII—Wooden Bridges and Trestles. *Am. Ry. Eng. Assn.—Bul.*, vol. 35, no. 364, Feb. 1934, pp. 997–1009, 1 supp. sheet. Simplification of grading rules and classification of timber; overhead wooden or combination wooden and steel highway bridges; standard wooden trestles for heavy loading; shear in checked beams, J. A. Newlin; best relationships between energy of hammer and weight or mass of pile for proper pile driving to include concrete piles; strengthening existing bridges; etc.

BUILDINGS

ACOUSTICS. L'acustica architettonica, G. del Grosso. *Ingegnere*, vol. 8, no. 18, Sept. 16, 1934, pp. 903–907. Principles of architectural acoustics; acoustic permeability; transmission of vibrations; acoustic properties of building interiors, particularly auditoriums.

APARTMENT HOUSES, WARSAW, POLAND. Prudential House in Warsaw (Poland), S. Bryla. *Am. Welding Soc.—Journal*, vol. 13, no. 5, May 1934, pp. 26–30. Architectural design of 17-story apartment house, second highest house in Europe; construction details; with special reference to welding; appendix contains comments on new Polish regulations concerning steel-welded construction.

BANK BUILDINGS, AIR CONDITIONING. Operating Results of Air Conditioning System Compared with Design Figures, J. R. Hertzler. *Heating, Piping & Air Conditioning*, vol. 6, no. 8, Aug. 1934, pp. 354–358. Engineering calculations involved in selection of refrigeration equipment and comparison of test results and theoretical analysis of heat-load conditions obtaining in Union Dime Savings Bank, New York, after installing new air-conditioning equipment to supplement existing supply and exhaust ventilation system. Before Am. Soc. Heating & Vent. Engrs.

BUILDING COSTS. Four Comparable Buildings Reveal Trend of Costs Since 1928, F. J. Knox. *Eng. News-Rec.*, vol. 113, no. 10, Sept. 6, 1934, pp. 295–298. Wide variations in costs and specifications found in analyzing similar university classroom units built during last 7 years; cubic-foot costs on present construction are 40 per cent lower than those of 1928, despite more elaborate finishing.

BUILDINGS, WIND STRESSES. Bases pour le calcul des constructions sous les effets du vent, F. Biron. *Travaux (formerly Science et Industrie)*, vol. 18, no. 18, June 1934, p. 236. Collection of fundamental formulas for design of buildings to withstand wind stresses.

EXHIBITION BUILDINGS. Les grands palais de l'exposition Universelle et Internationale de Bruxelles 1935, L. Baes. *Ossature Metallique*, vol. 3, no. 6, June 1934, pp. 279–297. Buildings at General International Exhibition in Brussels 1935; general review of construction of large steel buildings, with special reference to welding applications.

CITY PLANNING

HOUSING, FRANCE. La cité gratte-ciel de Drancy, P. Devaux. *Nature (Paris)*, no. 2927, Apr. 15, 1934, pp. 347–355. Non-technical description of Cité de la Muette settlement at Drancy, France, consisting of five 15-story towers, with 10 adjoining long 4-story blocks of apartments; use of standardized construction materials and methods.

CONCRETE

BEAMS. Concrete Beam with Pre-stressed Bars Tested, W. K. Hatt, *Eng. News-Rec.*, vol. 113, no. 11, Sept. 13, 1934, p. 345. Report on tests at Purdue University, involving exact measurements on comparative behavior of reinforced-concrete beam with adhesive bond between steel and concrete, and beam of same design with bond destroyed; rods pre-stressed in tension and concrete in compression.

CONSTRUCTION, COLD WEATHER. Betonieren bei Frost, W. Wichmann. *Zement*, vol. 23, nos. 29 and 30, July 19, 1934, pp. 421–423, and July 26, pp. 436–439. Concrete construction during frost; report of practical experiences and scientific studies in Soviet Union.

CONSTRUCTION, GROUTING. Matériels et methodes d'injection dans les travaux publics, P. Bachy. *Science et Industrie*, vol. 18, no. 16, Apr. 1934, pp. 154–160. Historical review and outline of modern practice of cement grouting in the United States and various European countries; materials, processes, and equipment, including graphical recorders of grouting pressures.

CONSTRUCTION, PUMP PLACING. Les pompes à béton et leur emploi. *Science et Industrie*, vol. 18, no. 15, Mar. 1934, pp. 108–116. Symposium of following papers: Composition and Automatic Manufacture of Concrete Placed by Pumping, R. Londais; Development of Concrete Pump and Its Present Capacity, A. Kleinlogel; Hobbs Concrete Pump, F. Fiorentini; Giese-Kooyman Pump.

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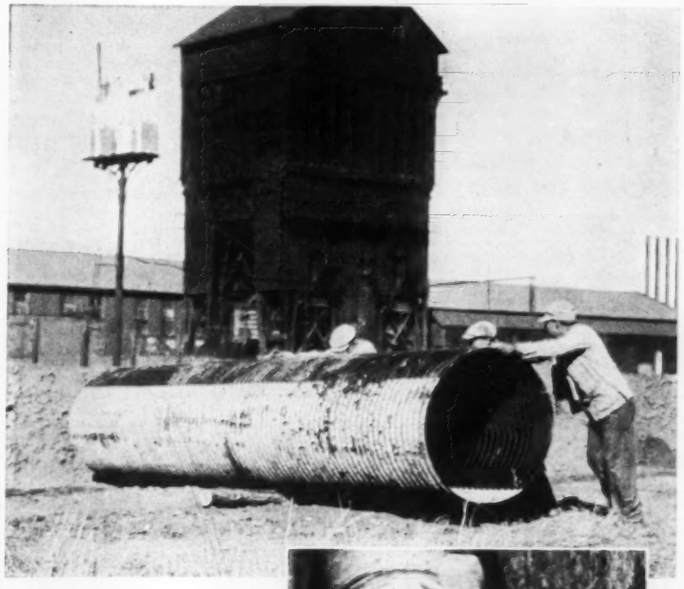

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CONSTRUCTION, VIBRATING. Ruettelbeton. Untersuchungen ueber das Verdichten des Betons durch Ruetteln, O. Graf and K. Walz. *VDI Zeit*, vol. 78, no. 35, Sept. 1, 1934, pp. 1037–1041. Original experimental study of effect of vibrating on strength of concrete; review of commercial vibrators and vibrating methods; effect of vibrating on bond of concrete with reinforcing steel; proper period and duration of vibration.

CONSTRUCTION, VIBRATING SYMPOSIUM. Enquete sur la vigration du béton en grosses masses (Barrages, Digues maritimes, etc.). *Science et Industrie*, vol. 18, no. 14, Feb. 1934, pp. 43–92. Symposium on effect of vibrating on mass concrete used in construction of dams, breakwaters, and similar large structures, including papers and replies to questionnaire by: Beauchamp, Bolomey, Brice, Broquaire, Campus, Chagnaud, Clairgeon, Coyne, Deniau, Feret, Graf, Hersent, Koch, Lebelle, Miche, Outrey, Quennessen, Renaud, and Santilman. Bibliography.

DAMS, COOLING. Cooling Boulder Dam Concrete, B. W. Steele. *Eng. News-Rec.*, vol. 113, no. 15, Oct. 11, 1934, pp. 451–455. Data for one year on the operation of refrigerating system circulating water, at temperature of 40 F, through concrete of Boulder Dam to extract heat of hydration and cool mass to permit immediate grouting of construction joints; cross section of dam showing isotherms and result of cooling; temperature curves typical of heating and cooling of normal, blended, and low-heat cement.

DESIGN, FORMULAS. Vereinfachte Berechnung rechteckiger Eisenbetonquerschnitte mit doppelter Bewehrung, K. S. Beljajew. *Zement*, vol. 23, no. 27, July 5, 1934, pp. 388–390. Formulas for simplified calculation of rectangular reinforced concrete cross sections with double reinforcement.

DESIGN, QUALITY. Le contrôle rapide de la qualité d'un béton, J. Lachaise. *Revue des Matériaux de Construction et de Travaux Publics*, no. 295, Apr. 1934, pp. 115–119. Rapid control of quality of concrete; application of Bolomey's equation for strength of concrete and evaluation of necessary terms from available data.

DISINTEGRATION. Versuche ueber den Einfluss verschiedener Zemente auf die Widerstandsfaehigkeit des Betons in angreifenden Waessern, O Graf and K. Walz. *Zement*, vol. 23, nos. 27, 28, 31, 32, and 33, July 5, 1934, pp. 376–388; July 12, pp. 401–411; Aug. 2, pp. 448–453; Aug. 9, pp. 461–466, and Aug. 16, pp. 473–475. Experimental investigation of influence of different cements on resistance of concrete in corrosive waters.

LIGHT WEIGHT. Light-weight Slag Concrete, I. Lyse. *Am. Concrete Inst.—Journal*, vol. 6, no. 1, Sept.–Oct. 1934, pp. 1–7. Tests of light-weight concrete weighing 113 lb per cu ft, with coarse aggregate of porous slag produced by special process of water-cooling ordinary blast furnace slag; physical and chemical characteristics of slag, concrete weight, absorption, bond, durability, fire resistance, compressive strength, transverse strength, wear resistance, toughness, workability, and yield; use of slag as fine aggregate.

MIXERS, FLOATING. Floating Mixing Plants Will Concrete Wheeler Dam, L. H. Huntley. *Eng. News-Rec.*, vol. 113, no. 14, Oct. 4, 1934, pp. 431–432. Plans for concreting and special features of cement-handling equipment for mixing 500,000 cu yd of concrete, in multiple plants placed on barges.

RAILROAD STRUCTURES, MASONRY. Report of Committee VIII—Masonry. *Am. Ry. Eng. Assn.—Bul.*, vol. 35, no. 364, Feb. 1934, pp. 957–996. Specifications and principles of design of plain and reinforced concrete; progress in concrete manufacture; foundations; specifications for lining railway tunnels with concrete; pneumatically projected concrete; design of expansion joints involving masonry structures.

REFRACTORY MATERIALS, CEMENTS. Refractory, Heat-Resisting Concretes Show Stamina in Furnace Uses. *Steel*, vol. 95, no. 15, Oct. 8, 1934, pp. 29–32. Brief history of refractory concrete; at present time there are 25 trade-marked mixtures for making; replacement of building cement with refractory concrete for furnace construction and results obtained; heat-resisting properties.

REINFORCEMENT. L'emploi dans le béton armé des aciers à haute résistance. *Science et Industrie*, vol. 18, no. 17, May 1934, pp. 179–194. Symposium on use of special steels in concrete reinforcement, including following articles: High-Strength Steel in Reinforced Concrete, F. de Emperger; Use of Steel of High-Elastic Limit in Reinforced Concrete, A. Brebera; New Type of Reinforcement for Reinforced Concrete Structures, A. Kleinlogel.

DAMS

BOULDER DAM PROJECT, CABLEWAYS. World's Largest Cableway to Serve Boulder Dam Plant, C. C. Clymer. *Power*, vol. 78, no. 9, Sept. 1934, pp. 502–503. 150-ton cableway required to ower heavy material from canyon top to Boulder Dam power house; hoisting drums are largest constructed for cableway use; they are 13 ft in diameter, with face 14.5 ft wide, built entirely of rolled shapes, electrically welded, and made in two sections to facilitate shipment.

BOULDER DAM PROJECT, DESCRIPTION. Le barrage Boulder aux États-Unis. *Technique des Travaux*, vol. 10, no. 7, July 1934, pp. 409–434. Description of Boulder Dam Project and Boulder City with particular reference to construction of diversion tunnels, mass concrete of dam, welded penstocks, and power plant.

BOULDER DAM PROJECT, HYDRAULIC VALVES. Hydraulic Valves and Gates for Boulder Dam—III, P. A. Kinzie. *Mech. Eng.*, vol. 56, no. 10, Oct. 1934, pp. 593–606. Design and fabrication of needle valves and paradox emergency gates.

CONCRETE ARCH, COLORADO. Taylor Park Dam Will Provide Irrigation Storage in Colorado. *Western Construction News*, vol. 9, no. 9, Sept. 1934, pp. 288–290. Features of concrete-arch dam, 200 ft max. height, 850 ft crest length, to be built with PWA funds for Uncompahgre project, on Taylor River near Almont, Colo.; to cost about $2,000,000.

CONCRETE GRAVITY, COSTS. Grand Coulee Dam, Washington. *Eng. News-Rec.*, vol. 113, no. 15, Oct. 11, 1934, pp. 481. Summary of unit prices bid on construction of dam in Washington, which is of concrete gravity section, 300 ft in max. height, with overflow section 1,800 ft long, and two non-overflow power-house sections 592 and 754 ft long.

CONCRETE GRAVITY, INDIA. Largest British Dam Completed in India. *Eng. News-Rec.*, vol. 113, no. 13, Sept. 21, 1934, pp. 405–406. Design and construction of Mettur Dam containing 2,000,000 cu yd of masonry and concrete, 230 ft high and 5,000 ft long, completed on Cauvery River after 6-year construction period; reservoir with capacity of 2,140,000 acre-ft will be used for rice irrigation and flood control.

EARTH, MATERIALS TESTING. Procédés pratiques de recherches permettant de déterminer si une terre donnée convient à la construction d'un barrage, H. E. Gruner and R. Haefeli. *Travaux (formerly Science et Industrie)*, vol. 18, no. 18, June 1934, pp. 249–252. Practical laboratory methods for determining suitability of given earth materials for construction of dam; tests of shearing strength and permeability to water. Before International Congress on Large Dams held in 1934.

RESERVOIRS, MARYLAND. Storage Dam Recommended to Control Upper Potomac. *Eng. News-Rec.*, vol. 113, no. 12, Sept. 20, 1934, pp. 360–361. Features of earth dam, 155 ft max. height, proposed on Savage River to impound 6½ billion gal; will increase dry-weather flow in upper Potomac to 60 mgd.

WEIRS, DISCHARGE. Die Abflusserscheinungen und Druckverhaeltnisse an Klappenwehren, Untersuchungen aus dem Flussbaulaboratorium der Technischen Hochschule Karlsruhe, H. Schwarzmann. Munich and Berlin, R. Oldenbourg, 1934, 41 pp., illus., diagrs., charts, tables. 3.80 rm. Results of extensive experiments with model, which give clear picture of pressure conditions in shutter weirs; upon basis of experiments, flow over weirs was investigated generally and factors that determine its amount established. Eng. Soc. Lib., N.Y.

FLOOD CONTROL

MISSISSIPPI RIVER. National Water Policy in the Making, C. H. Brown. *Eng. News-Rec.*, vol. 113, no. 13, Sept. 27, 1934, pp. 393–396. Review of early work of Mississippi Valley Committee; policies formulated as to flood-control projects to be financed in part by the PWA; rising importance of water as national asset; reasons for advance planning; factors in water policy; interstate problems; studies and reports.

RIO GRANDE. Mexico and United States Join in Border Flood Control, L. M. Lawson. *Eng. News-Rec.*, vol. 113, no. 14, Oct. 4, 1934, pp. 419–423. To curb the destructive flow of the Rio Grande where it forms the boundary between the United States and Mexico, the two governments have undertaken a program of channel rectification and flood control, which will cost $12,600,000; program includes levee construction, an earth dam with a capacity of 400,000,000 cy yd, and provision for floodways in lower end of valley; irrigation investigations.

FOUNDATIONS

DESIGN. L'étude des fondations. État actuel des connaissances, Buisson. *Science et Industrie*, vol. 18, no. 16, Apr. 1934, pp. 142–148. Review of recent experimental and theoretical studies of foundations in Austria, Germany, Holland, the United States, and other countries; principles of selection of proper foundation structures; settlement of buildings; waste due to errors in foundation design.

SOILS, RECENT STUDIES. L'études des fondations. Caractéristiques physiques et mécaniques des sols, Buisson. *Science et Industrie*, vol. 18, no. 17, May 1934, pp. 195–203. Review of recent developments and theoretical and experimental studies on foundations, with special reference to physical and mechanical properties of soils; outline of modern soil mechanics, largely based on research by Terzaghi, Krey, and others.

L'étude des Fondations. Caractéristiques physiques et mecaniques des sols, Buisson. *Travaux (formerly Science et Industrie)*, vol. 18, nos. 19 and 20, July 1934, pp. 285–294, and Aug. pp. 339–348. Terzaghi's hypothesis on viscosity of water in very narrow cracks; consistency and other properties of clay materials; compression tests of soils; modulus of elasticity of coherent soils; friction and slipping in sand and clay materials; practical conditions of rupture of soil mass in case of sudden loading.

SOILS, RESEARCH. Le Laboratoire d'étude du sol de l'Institut technique du Bâtiment et des Travaux publics, à Paris, H. Lossier. *Génie Civil*, vol. 105, no. 12, Sept. 22, 1934, pp. 259–262. Report on organization and work of soil physics laboratory of Institut Technique du Bâtiment et des Travaux Publics, Paris; methods of determining texture, cohesion coefficient, permeability, and angle of internal friction of foundation soils adopted by this laboratory; forecasting settlement of structures.

SOILS, STRESSES. Détermination expérimentale de la courbe de Mohr pour un échantillon quelconque de terre sous l'influence de differentes pressions principales, A. S. Buisman. *Science et Industrie*, vol. 18, no. 16, Apr. 1934, pp. 149–153. Experimental determination of Mohr circle for any soil sample subjected to different principal stresses, including cases of free and laterally supported samples. Bibliography.

HYDRAULIC ENGINEERING

MODELS, SIMILITUDE. Similitude Requirements in Model Design, R. W. Carlson. *Eng. News-Rec.*, vol. 113, no. 8, Aug. 23, 1934, pp. 235–238. Basis of model design in fields of both structures and hydraulics reduced to two rules: (1) model shall be geometrically similar to its prototype, except as to dimensions that do not affect behavior of model and (2) force scale-reduction factor shall be same for forces arising from each of various influences. Brief discussion by K. C. Reynolds appended.

HYDRO-ELECTRIC POWER PLANTS

HYDRO-ELECTRIC POWER DEVELOPMENTS, NEBRASKA. Two Public Power Projects Get Under Way in Nebraska. *Eng. News-Rec.*, vol. 113, no. 15, Oct. 11, 1934, pp. 469–472. Features of Loup River and Sutherland projects proposing the development of 240,000,000 kw-h per annum by the Loup River Public Power District; storage of 146,000 acre-ft of water in the Sutherland Reservoir, and construction of 34,000-hp hydro-electric plant near North Platte.

INLAND WATERWAYS

CANAL LOCKS, MODELS. Les essais sur modèles des ecluses du canal Albert, A. Braeckman. *Technique des Travaux*, vol. 10, no. 6, June 1934, pp. 359–369. Laboratory study of erosion of models of canals; detailed topography of canal bottom with drop of 5.7 m and 12 m; discussion of effect of presence of bar and of its particular position with reference to locks; study of streamlines at lock entrances.

IRRIGATION

IRRIGATION CANALS, CALIFORNIA. All-American Canal Project Started on 30-Mile Section. *Eng. News-Rec.*, vol. 113, no. 16, Oct. 18, 1934, pp. 488–489. Contracts totaling $5,000,000 under way, involving 40,000,000 cu yd of excavation; canal to convey water from Colorado River to Imperial and Coachella valleys in southern California for irrigation.

MATERIALS TESTING

BEAMS, BENDING. La flexion de piezas rectas por encima del limite elastico, A. Fernandez. *Ingenieria Naval*, vol. 2, no. 7, Mar. 1934, pp. 140–151. Bending of straight pieces beyond elastic limit.

BRICK CONSTRUCTION, TESTINGS. Ziegel und Ziegelbauteile. *Mitteilungen der deutschen Materialpruefungsanstalten*, no. 17, 1934, pp. 257–262. Preliminary report on the results of tests made at the Materials Testing Laboratory at Berlin-Dahlem on the strength of individual hollow bricks and of brickwork structures, using various kinds of mortar; brick walls tested were up to 38 cm in thickness, 330 cm in height.

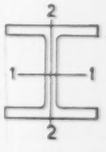
ROAD MATERIALS, BITUMINOUS. Study of Some Liquid Asphaltic Materials of Slow-Curing Type, R. H. Lewis and W. O'B. Hillman. *Pub. Roads*, vol. 15, no. 4, June 1934, pp. 85–106. Experimental study of adequacy of present laboratory tests of weathering characteristics of slow-curing liquid asphaltic road materials; asphaltic-residue test, when used alone, does not indicate probable rate of loss of volatile matter; bonding strength or stability of mineral aggregate mixed with liquid asphaltic materials depends on characteristics not ascertainable by present testing method.

Rolled steel has proved so efficient in bearing pile work that now we offer nine new sections developed particularly for this purpose. These complete a series of twelve sizes, as listed below. The new sections are designated by the prefix letters CBP.

You should see the data we have developed on this subject of bearing piles. To those unacquainted with this modern use of steel, these figures present convincing proof of the economy and efficiency of steel bearing piles. We welcome an opportunity of discussing this subject with you and would particularly like to point out the efficiency and adaptability of these new sections.

I

SECTION INDEX AND NOMINAL SIZE	Depth of Section	Wgt. Per Foot	Area of Section	FLANGE		Web Thickness	AXIS 1-1			AXIS 2-2		
				Width	Thickness		I	S	r	I	S	r
	In.	Lbs.	In.²	In.	In.	In.	In.⁴	In.³	In.	In.⁴	In.³	In.
CBP-146	14.18	117	34.42	15.599	.778	.779	1233.5	174.0	5.99	492.8	63.2	3.78
14 X 16	13.99	102	30.00	15.500	.681	.680	1060.9	151.7	5.95	423.1	54.6	3.75
CBP-145	13.86	89	26.19	14.696	.616	.616	909.1	131.2	5.89	326.2	44.4	3.53
14 X 14½	13.70	73	21.46	14.518	.538	.438	762.2	111.3	5.96	274.5	37.8	3.58
CBP-124	12.12	74	21.76	12.217	.607	.607	566.5	93.5	5.10	184.7	30.2	2.91
CB-124	12.12	65	19.11	12.000	.506	.390	533.4	88.0	5.28	174.6	29.1	3.02
CBP-124	11.78	53	15.59	12.046	.437	.436	394.8	67.0	5.03	127.4	21.2	2.86
12 X 12												
CBP-103	10.01	57	16.76	10.224	.564	.564	294.7	58.9	4.19	100.6	19.7	2.45
CB-103	10.00	49	14.40	10.000	.558	.340	272.9	54.6	4.35	93.0	18.6	2.54
CBP-103	9.72	42	12.35	10.078	.418	.418	210.8	43.4	4.13	71.4	14.2	2.40
10 X 10												
CBP-83	8.03	36	10.60	8.158	.446	.446	119.8	29.9	3.36	40.4	9.9	1.95
CB-83	8.06	33	9.70	8.012	.463	.300	117.9	29.3	3.49	39.7	9.9	2.02
8 X 8												



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CARNEGIE STEEL COMPANY Pittsburgh
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PORTS AND MARITIME STRUCTURES

BUENOS AIRES. Buenos Aires as Port and City. *Naut. Gaz.*, vol. 124, no. 20, Sept. 29, 1934, pp. 5–8. Historical review, port consists of section formerly known as Port Madero, north and south basins with four joining docks, south dock, Riachuelo port, and new port; customs warehouses of modern construction; railway facilities; grain elevators have total capacity of about 167,000 tons.

GREECE. Les travaux récents exécutés dans les ports helléniques. L. Pondeveaux. *Génie Civil*, vol. 105, no. 10, Sept. 8, 1934, pp. 219–220. Review of recent construction at such Greek ports as Piraeus, Salonique, and Patras.

PIERS, RECREATION. Pier Rebuilt for Recreation Center by Relief Workers, A. C. Babcock. *Eng. News-Rec.*, vol. 113, no. 12, Sept. 20, 1934, pp. 361–362. Alterations on single-deck pier on Staten Island, N.Y., including fabrication of 300 tons of steel, carried out with hand tools and minimum equipment.

POLLUTION. Los residuos de petróleo en las dársenas y puertos. F. Corominas. *Ingeniería Naval*, vol. 2, no. 13, Sept. 1930, pp. 482–486. Petroleum residues in harbors and ports; British regulations and specifications as to requirements for oil separators; purification of bilge water; test data.

QUAY WALLS, GREAT BRITAIN. Parkeston Quay Extension. *Shipbldg. & Shipg. Rec.*, vol. 44, no. 14, Oct. 4, 1934, pp. 364–366. Details of second extension of quay since first built in 1883, which provides additional 1,120 ft of quay frontage for London and North Eastern Railway and other traffic at Harwich; general plan showing extension works and key map indicating position relative to London.

SAINT JOHN, N. B. Saint John, Canada's Great National Port of Atlantic. *Naut. Gaz.*, vol. 124, no. 19, Sept. 15, 1934, pp. 7–9. Re-establishment of city of Saint John to maritime eminence; project will provide several deep-water berths on western harbor front, in addition to twelve already in service.

SEAWALLS, CONSTRUCTION. Seattle Builds Pre-Cast Seawall. G. E. Bjork. *Western Construction News*, vol. 9, no. 9, Sept. 1934, pp. 280–284. Improvement of Railroad Avenue in Seattle by construction of 6,700 ft of concrete seawall; timber-pile relieving platform carries roadway load through mud to hard stratum; driving vertical and batter piles; steel-sheet piling placed as cut-off wall; wall sections are cast in plant especially provided for this work; fill material for roadway.

TRAIN FERRIES. Nanking-Pukow Train Ferry. *Engineer*, vol. 158, no. 4105, Sept. 14, 1934, pp. 252, 254–256, and 260. Details of bridge approaches; apron designed to take up any change of level of steamer occurring during loading or unloading; steamer "Changkiang" is twin-screw vessel built and engined at Neptune Works of Swan, Hunter and Wigham, Richardson; length 372 ft; width 58 ft 6 in.; designed to carry total live load of 1,200 tons; propelled by two 3-cycle, triple-expansion, surface-condensing engines.

VALPARAISO. Valparaiso, Pearl of Pacific. *Naut. Gaz.*, vol. 124, no. 15, July 21, 1934, pp. 7–11 and 30–31. Work of improvement and defense; protective works; port features and characteristics.

RAILROADS, STATIONS, AND TERMINALS

TRAIN SHEDS, ROOFS. Flat Roof for Train-Shed Built Under Old Arches, E. E. R. Tratman. *Eng. News-Rec.*, vol. 113, no. 12, Sept. 20, 1934, pp. 363–367. Reconstruction of train-shed roof at LaSalle Street terminal station in Chicago; lofty covering 31 years old, replaced by low flat roof with new trusses supported on brackets welded to old columns; erection methods and alternative designs.

ROADS AND STREETS

BRICK, GERMANY. Fortschritte im Klinkerstrassenbau, E. Gerlach. *VDI Zeit.*, vol. 78, no. 35, Sept. 1, 1934, pp. 1027–1028. Review of vitrified-brick pavement practice in Germany since 1838; suggestions for experimental research and development of brick-concrete pavements; proper use of brick pavement.

BRICK, UNITED STATES. Paving with De-Aired Brick in Philadelphia. *Eng. News-Rec.*, vol. 113, no. 13, Sept. 27, 1934, pp. 396–398. Chestnut Street, Philadelphia, being repaved with de-aired brick following most recent practice of using cementitious cushion and calcium chloride wash to protect surface from surplus filler asphalt.

CAST IRON. La fonte et le revetement des routes, L. J. Gouttier. *Revue de Fonderie Moderne*, vol. 28, May 25, 1934, pp. 145–147. Note on use of cast iron in road construction.

MAGNET SWEEPERS. Corregidor Nail-Picker. G. H. Stubbs. *Coast Artillery Journal*, vol. 77, no. 5, Sept.–Oct. 1934, pp. 361–362. Description of magnetic nail picker of original design.

NEW JERSEY. Modern Planning and Design Characterize New Jersey Highway. *Eng. News-Rec.*, vol. 113, no. 10, Sept. 6, 1934, pp. 305–307. Relocation of 10-mile stretch of Pompton Turnpike, northwest of Newark metropolitan area, showing far-seeing location and roadway design practices; innovation in joint design, which provides strength for load transfer and water-tightness by increased dowel strength; original ¾-in. dowels were increased to 1 in., and stricter attention was given to dowel alignment with slab.

RAILROAD CROSSINGS, ACCIDENT PREVENTION. How Erie Has Reduced Highway Crossing Accidents. *Ry. Age*, vol. 97, no. 7, Aug. 18, 1934, pp. 215–217. Nine important features in program that effects 23 per cent reduction include proper whistling, improvement of view, paving, and care of roadway at crossings, additional crossing protection, better lights, advance warning signals, educational work in schools and clubs, and publicity in newspapers.

VIADUCTS, CONCRETE ARCH. Long Concrete-Arch Viaduct Built near Cleveland. W. H. Rabe and D. H. Overman. *Eng. News-Rec.*, vol. 113, no. 15, Oct. 11, 1934, pp. 467–469. Description of Brookpark Road viaduct near Cleveland, Ohio, 1,919 ft long, comprising eight concrete arch spans, with max. length of 192 ft 3 in., max. height above ground line 116 ft; special architectural treatment; cooling of mass concrete in piers; use of railing expansion joints of rubber; prevention of cracks in piers; rib and deck design; contract price was $378,980.

SANITARY ENGINEERING

MOSQUITO CONTROL. Note on Erosion, and Silting Caused by Anti-Malarial Sluicing, J. P. K. Wilkins. *Eng. Assn. Malaya 1932—Trans.*, vol. 9, 1933, pp. 170–171 (discussion) 172–179. Experience with anti-larval flushing and its effect on soil.

SEWERAGE AND SEWAGE DISPOSAL

CANNERIES, WASTE DISPOSAL. Liquid Waste Disposal, H. H. Young and A. E. Kimberley. *Food Industries*, vol. 6, no. 7, July 1934, pp. 298–299 and 322. System of disposal used by large Indiana canning plant where only outlet for sewage was small, easily polluted stream; tests made at various times indicated that strength of waste was reduced about 70 per cent, exclusive of undetermined reduction effected by separation of concentrated wastes and by efficient housekeeping.

FISH PONDS. Arbeitsbeschaffung durch Bau von Abwasserfischteichen, T. Falck. *Gesundheits-Ingenieur*, vol. 57, no. 18, May 5, 1934, pp. 228–230. Creating employment by construction of sewage-fed fish ponds; such ponds can be used in connection with other sewage treatment processes and are especially useful in providing basin to care for excess flow due to rains; data on lime and phosphorus contents of domestic sewage.

GERMANY. Vorschlaege fuer die Zukunftsentwicklung der Berliner Abwasserwirtschaft, E. Weise. *Gesundheits-Ingenieur*, vol. 57, no. 20, May 19, 1934, pp. 248–252. Proposals for future development of Berlin sewage disposal; suggestion for utilizing fertilizer value and also water present in sewage.

OPERATION, URBANA. Sewage-Plant Survey—VII. Data from Urbana and Champaign, Ill. *Eng. News-Rec.*, vol. 113, no. 13, Sept. 27, 1934, p. 404. Sewage-plant performance data, Urbana and Champaign, Ill.

STRUCTURAL ENGINEERING

BEAMS, CURVED. Elastic Bending of Curved Rectangular Bar Under Direct Stress, E. Jones and R. J. Cornish. *London, Edinburgh and Dublin Philosophical Mag. & Journal of Science*, vol. 18, no. 119, Sept. 1934, pp. 456–458. Derivation of formulas for bending of curved rectangular bar under uniformly distributed direct stress, taking into account alteration in depth of bar, having practical application in calculation of total energy of bent beams, arches, crane-hooks, and the like.

CHIMNEYS, DESIGN. Smokestack Foundation Designed Against Earthquake, L. T. Evans. *Eng. News-Rec.*, vol. 113, no. 11, Sept. 13, 1934, pp. 344–345. Formulas used in design of smokestack foundation for school buildings at Long Beach, Calif.

JOINTS, WOODEN. Tests on Nailed Joints Provide Data on Strengths, J. B. Wells. *Eng. News-Rec.*, vol. 113, no. 13, Sept. 27, 1934, pp. 391–392. Report on tests made at Stanford University in which usual construction conditions were simulated; data on load-deformation relation and safe carrying strengths; comparison between timber and plywood.

PIPE LINES, STRESSES. Expériences relatives à la determination des efforts supportes par des tuyaux placés en terre, R. Lazard. *Travaux (formerly Science et Industrie)*, vol. 18, no. 18, June 1934, pp. 237–248. Review of experimental work done in United States, between 1908 and 1927, for determination of stresses in underground pipe lines, sewers, and culverts.

TUNNELS

TUNNELS, VEHICULAR, VENTILATION. Controle de la teneur de l'atmosphère en oxyde de carbone. *Metaux & Machines (formerly Science & Industrie)*, vol. 18, nos. 247 and 248, Aug.–Sept. 1934, pp. 262–264. Control of carbon-monoxide contents of atmosphere and control equipment as applied to vehicular tunnel under the Scheldt River in Antwerp.

VIADUCTS, RAILROAD. Reconstruction of Boyne Viaduct, Drogheda, G. B. Howden. *Instn. Civ. Engrs. Ireland—Trans.*, vol. 60, Nov. 1933–May 1934, pp. 71–92 (discussion) 93–111, 9 supp. sheets. History of double-track viaduct of Great Northern Railway Co., on main line between Dublin and Belfast over river Boyne; construction of new 3-span, steel-truss structure; viaduct including masonry-arch approaches is 1,760 ft long; tests of steel members.

WATER RESOURCES

ANALYSIS, UNITED STATES. Industrial Utility of Public Water Supplies in United States, 1932, W. D. Collins, W. L. Lamar, and E. W. Lohr. *U. S. Geol. Survey Water-Supply Paper*, no. 658, 1934, 135 pp., 15 cents. Study of distribution of water hardness; industrial and domestic treatment of water from public supplies; 100 pages of tabulated water analyses from public supplies.

UNDERGROUND SUPPLY, JAPAN. Summary of Studies on Collection Wells and Galleries as Sources of Water-Supplies, Y. Yoshida. Kumamoto, Japan, Kumamoto Technical College, 1934, 96 pp., figs., diagrs., tables, charts. Theories of flow of water through sands, gravels, sandstones, and other porous materials, also clay materials; slow sand filtration and natural infiltration galleries constructed in river or lake beds; hydraulics of wells and galleries as sources of water supply; artesian wells.

UNDERGROUND SUPPLY, UNITED STATES. Groundwater in Midwest Drought Area, O. E. Meinzer. *Eng. News-Rec.*, vol. 113, no. 16, Oct. 18, 1934, pp. 495–498. Interpretation of influence of geological formations on ground-water resources of north interior of the United States and appraisal of effect of drought on these water supplies; hydrographs of two wells near Washington, D.C., indicating seasonal fluctuation in level and marked recovery from low levels caused by drought of 1930–1931.

WATER TREATMENT

BELGIUM. Henry Process for Clarification of Polluted Water. *Engineering*, vol. 138, no. 3581 and 3584, Aug. 31, 1934, pp. 213–215, and Sept. 21, pp. 293–295. Process developed and successfully applied by R. A. Henry of Liége, Belgium, can effect rapid clarification of water polluted with mineral or animal refuse, and has been applied in particular to clarification of slurry water from coal-washing plants, to treatment of river water containing trade wastes and sewage, and to treatment of raw sewage itself.

FILTRATION PLANTS, COSTS. Mechanical Filter Plant, Reading, Pa. *Eng. News-Rec.*, vol. 113, no. 15, Oct. 11, 1934, p. 482. Summary of unit costs bid on construction of building and equipment of new mechanical filter plant at Reading, Pa.; minimum total bid was in excess of $600,000.

FILTRATION PLANTS, EFFICIENCY. New Index Recommended for Filter Efficiency, R. Hulbert and D. Feben. *Eng. News-Rec.*, vol. 113, no. 14, Oct. 4, 1934, p. 423. Study of performance of rapid-sand filters leading to conclusion that quantity filtered per foot of head loss, which takes into account different operating conditions, is more logical index to use in making comparisons than is duration of filter run.

FILTRATION PLANTS, FRANCE. L'usine de filtration et de sterilisation par l'ozone des eaux de la Ville de Nancy. *Génie Civil*, vol. 105, no. 9, Sept. 1, 1934, pp. 181–185. Description of water treatment plant for city of Nancy, France; population 120,000; consisting of infiltration galleries, flow-sand filters, and Otto ozone infiltration plant; capacity of new installation is 100,000 cu m per 24 hr.

WATER WORKS ENGINEERING

CONNEAUT, OHIO. Modern Waterworks Plant Replaces Obsolete System, W. L. Havens. *Eng. News-Rec.*, vol. 113, no. 11, Sept. 13, 1934, pp. 327–329. Recent history of Conneaut water works and description of new plant designed to serve population of 15,000; cost and operation of plant.

HYDRANTS, INSPECTION. Inspecting and Recording Condition of Fire Hydrants, C. A. Hechmer. *Eng. News-Rec.*, vol. 113, no. 11, Sept. 13, 1934, p. 334. Practice of Washington Suburban Sanitary District; form of record card.

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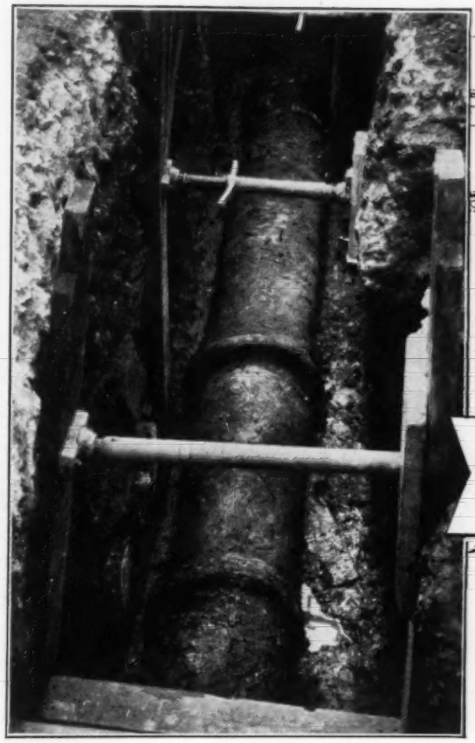

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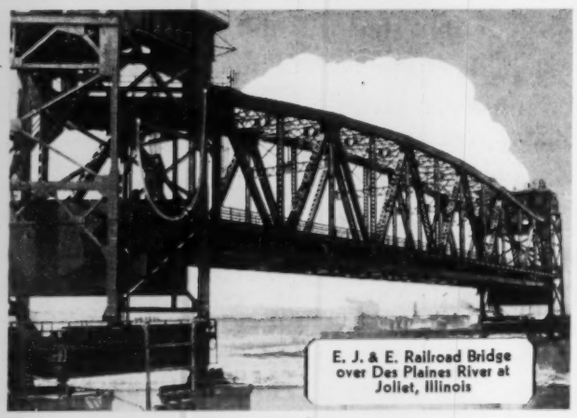

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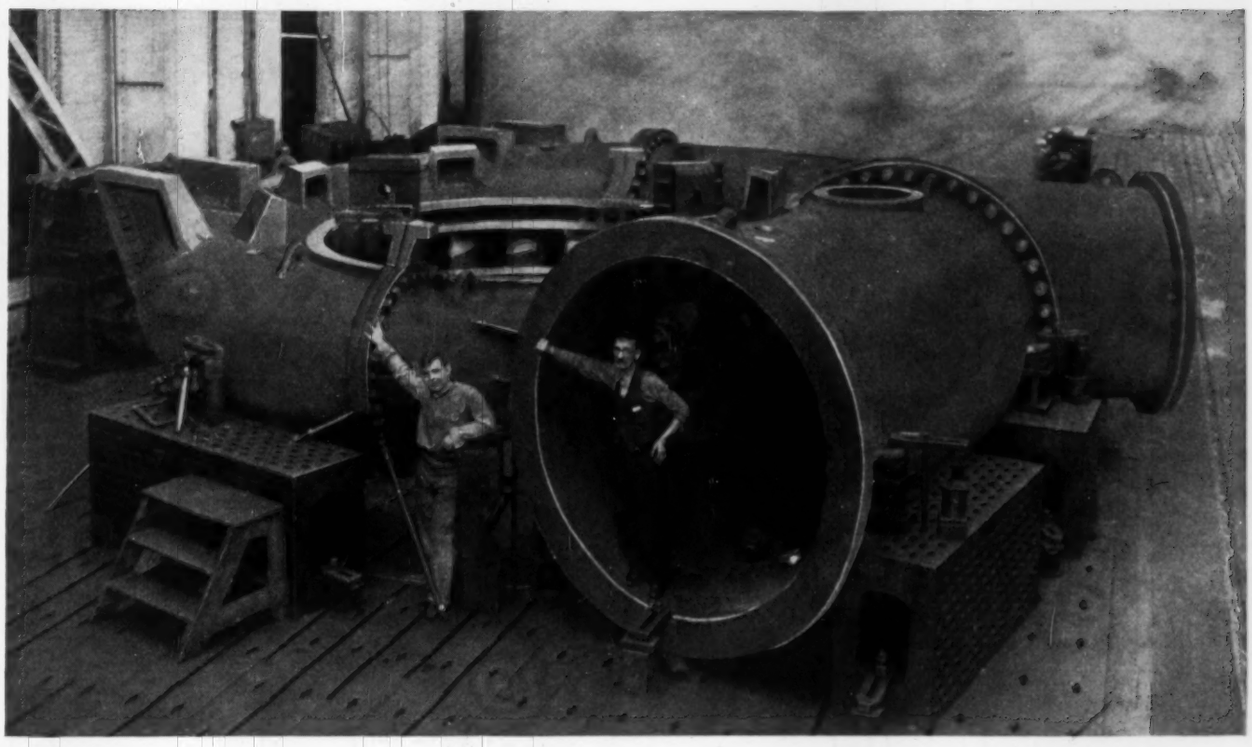

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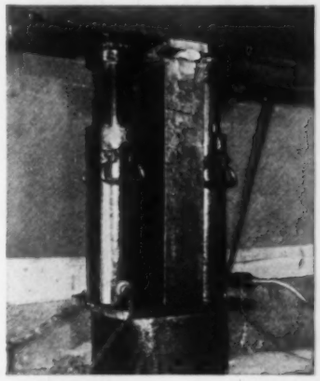

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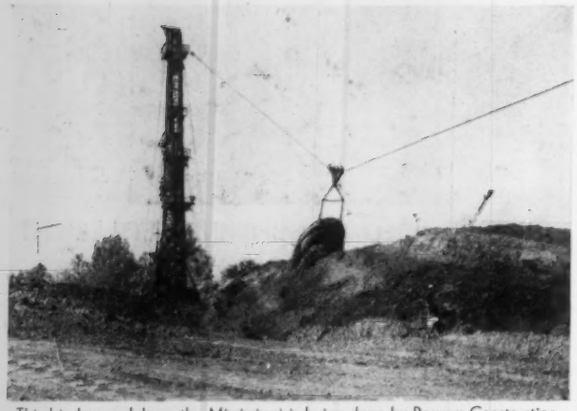

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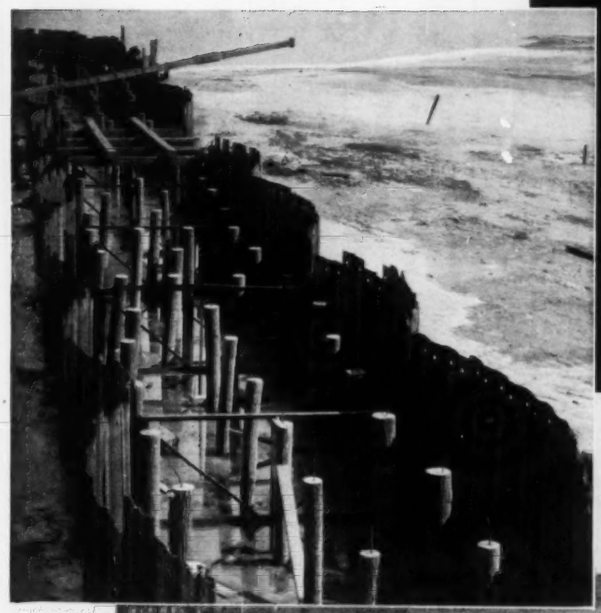

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At Top—*section of the cofferdam before filling.* **At Right**—*some of the permanent piling with cofferdam in background. 3200 tons of Inland Piling used: Section I-23 for cofferdam, Section I-31 for permanent cut off walls.*

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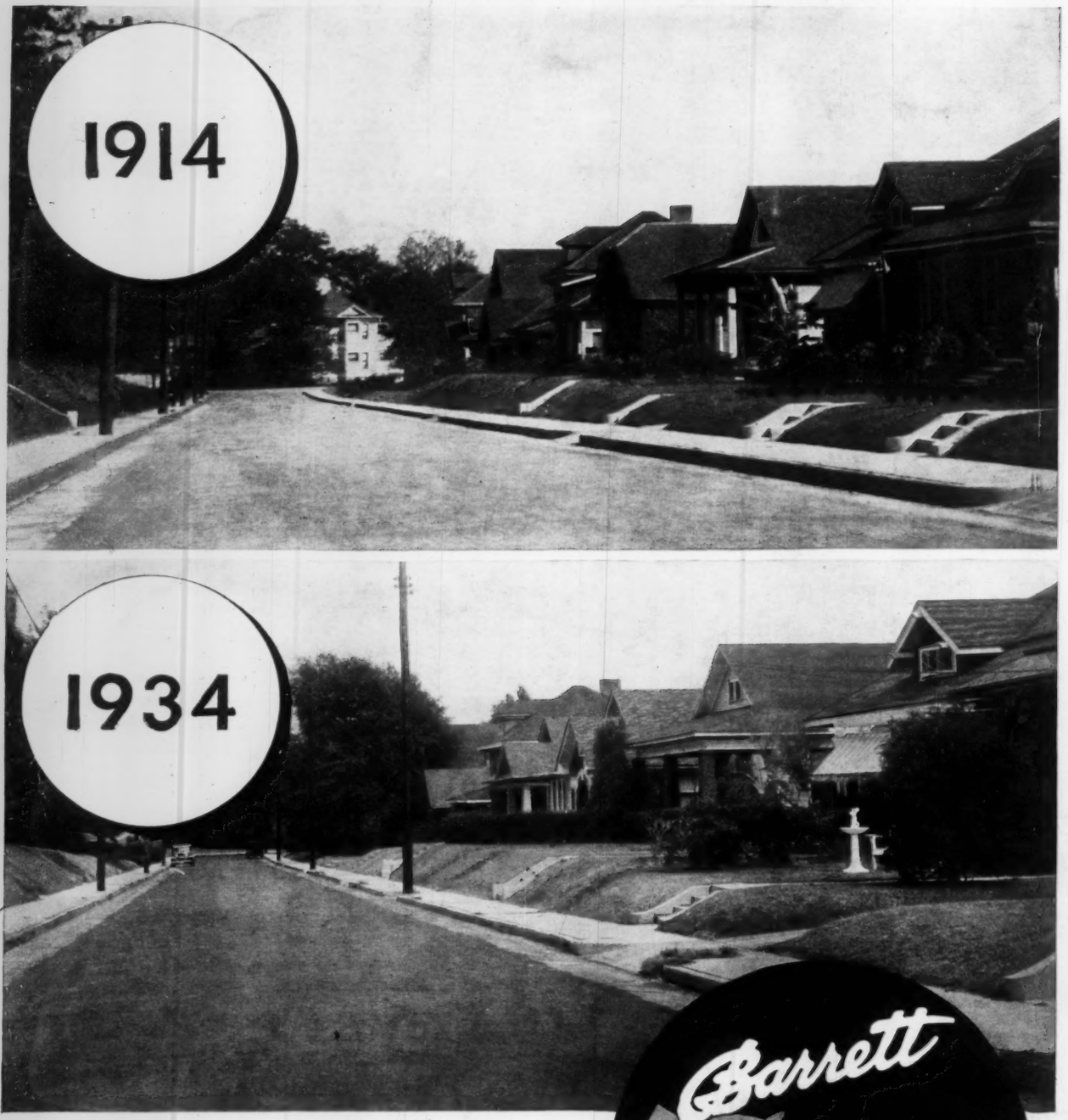

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